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ABSTRACT

These skill standards for the industrial maintenance general maintenance cluster are intended to be a guide to workforce preparation program providers in defining content for their programs and to employers to establish the skills and standards necessary for job acquisition. An introduction provides the Illinois perspective; Illinois Occupational Skill Standards and Credentialing Council requirements for occupational skill standards; sample format; occupational earnings and employment information; assumptions for these specific skill standards; and performance skill levels. The 77 skill standards are categorized into these 8 performance areas: general business; safety and environment; general maintenance; construction; plumbing and piping; mechanical maintenance; electrical maintenance; and heating, ventilation, air conditioning, and refrigeration. Components of each skill standard are performance area; skill standard, including conditions of performance, work to be performed, and performance criteria; performance elements; and performance assessment criteria, with a listing of required testing, certification, and/or licensing; product; and process. Appendixes include a cluster-specific glossary; cluster-specific tool kit; glossary; and listing of workplace skills. (YLB)

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ILLINOIS

OCCUPATIONAL SKILL STANDARDS

INDUSTRIAL MAINTENANCE GENERAL MAINTENANCE CLUSTER

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INDUSTRIAL MAINTENANCE
GENERAL MAINTENANCE CLUSTER

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SPECIAL THANKS

The IOSSCC wishes to thank State Farm Insurance for its in-kind donation hosting skill standard development meetings. Without their assistance, this project would not be complete.

ILLINOIS OCCUPATIONAL SKILL STANDARDS

INDUSTRIAL MAINTENANCE GENERAL MAINTENANCE CLUSTER

Endorsed for Illinois
by the
Illinois Occupational Skill Standards
and Credentialing Council

A MESSAGE FROM THE ILLINOIS OCCUPATIONAL SKILL STANDARDS AND CREDENTIALING COUNCIL

Preparing youth and adults to enter the workforce and to be able to contribute to society throughout their lives is critical to the economy of Illinois. Public and private interest in establishing national and state systems of industry-driven skill standards and credentials is growing in the United States, especially for occupations that require less than a four-year college degree. This interest stems from the understanding that the United States will increasingly compete internationally and the need to increase the skills and productivity of the front-line workforce. The major purpose of skill standards is to promote education and training investment and ensure that this education and training enables students and workers to meet industry standards that are benchmarked to our major international competitors.

The Illinois Occupational Skill Standards and Credentialing Council (IOSSCC) has been working with industry subcouncils, the Illinois State Board of Education and other partnering agencies to adopt, adapt and/or develop skill standards for high-demand occupations. Skill standards products are being developed for a myriad of industries, occupational clusters and occupations. This document represents the collaborative effort of the Manufacturing Subcouncil, and the Industrial Maintenance - General Maintenance Cluster Standards Development Committee.

These skill standards will serve as a guide to workforce preparation program providers in defining content for their programs and to employers to establish the skills and standards necessary for job acquisition. These standards will also serve as a mechanism for communication among education, business, industry and labor.

We encourage you to review these standards and share your comments. This effort has involved a great many people from business, industry and labor. Comments regarding their usefulness in curriculum and assessment design, as well as your needs for in-service and technical assistance in their implementation are critical to our efforts to move forward and improve the documents.

Questions concerning this document may be directed to:

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We look forward to your comments.

Sincerely,

The Members of the IOSSCC

TABLE OF CONTENTS

Introduction	The Illinois Perspective	vi
	IOSSCC Requirements for Occupational Skill Standards	viii
	Sample Format	ix
	Occupational Earnings and Employment Information	x
	Assumptions	xiii
	Performance Skill Levels	xiv
General Business	Develop Maintenance Schedule	1
	Manage Working Relationships with Customers	3
	Maintain Budget	5
	Order Materials and Supplies	7
	Maintain Storeroom	9
	Follow Preventive Maintenance Program	11
	Determine Quality Requirements	13
	Schedule Maintenance Staff	15
	Monitor Work of Subcontractors	17
	Update Job Requirements	19
Safety and Environment	Inspect Facility for Code Violations	21
	Store and Maintain Hazardous Materials	23
	Supervise Facilities Housekeeping	25
	Follow Accident/Incident Response Procedures	27
	Maintain Emergency Response Equipment	29
	Follow Proper Disposal Procedures	31
	Perform Safety and Security Checks	33
	Perform Outdoor Maintenance	35
	Maintain Fencing	37
	Maintain Parking Lot	39
General Maintenance	Set Up Ladders and Scaffolding	41
	Maintain Facility Drawings, Blueprints and Records	43
	Repair Basic Welded Steel Structures	45
	Repair Sheet Metal	47
	Move Heavy Objects	49
Construction	Paint Exterior and Interior Surfaces	51
	Repair Structures, Walls and Ceilings	53
	Maintain Roofs and Gutters	55
	Repair Windows and Glass	57
	Build/Erect or Modify Wood and Metal Structures	59
	Repair Concrete	61
	Repair Floors	63
	Install/Repair Door Locks and Hardware	65
Plumbing and Piping	Repair Toilet and Sink Fixtures, Faucets and Valves	67
	Remove Drain Clogs	69
	Install New Piping	71
	Inspect Fire Sprinkler Systems	73
	Monitor Sewer Systems	75
	Repair Gas and Water Lines	77
	Maintain Water Heater	79

TABLE OF CONTENTS

Mechanical Maintenance	Install/Repair Safety Guards	81
	Maintain Drive Belts and Pulleys	83
	Maintain Roller Chains and Sprockets	85
	Maintain Bearings	87
	Lubricate Mechanisms	89
	Maintain Air Compressors	91
	Maintain Centrifugal Pumps	93
	Maintain Coupling Alignment	95
	Maintain Compressed Gas Cylinder System	97
	Maintain Pneumatic Systems	99
	Maintain Hydraulic Systems	101
	Maintain Backup Power Generator	103
Electrical Maintenance	Repair or Replace Lighting and Fixtures	105
	Troubleshoot and Repair Faulty Electrical Circuits	107
	Install Conduit and Wiring	109
	Install Electrical Fixtures, Switches and Outlets	111
	Maintain Motors and Motor Starters	113
	Install and Repair Basic Electrical Appliances	115
	Maintain Fire Alarm System	117
	Maintain Security Alarm Systems	119
	Maintain Telephone System	121
Heating, Ventilation, Air Conditioning and Refrigeration (HVAC/R)	Monitor Energy Management Systems	123
	Maintain Air Conditioning System	125
	Evaluate Control Circuit Fuse and Replace	127
	Evaluate Thermostat Temperature Control and Operation	129
	Test for and Repair Refrigerant Leaks	131
	Replace Condenser Fan Blade	133
	Evaluate Thermocouple and Replace	135
	Evaluate Spark Ignitor and Replace	137
	Evaluate Hot Surface Ignitor and Replace	139
	Evaluate Gas Valve and Replace	141
	Inspect Belt Drive Blower Shaft, Bearings and Pulleys and Lubricate or Replace	143
	Inspect Primary Heat Exchanger and Clean or Replace	145
	Inspect Main Burner and Orifice and Clean or Replace	147
	Operate and Maintain Boiler	149
	Monitor Steam System Operation	151
	Maintain Steam Valves and Traps	153

THE ILLINOIS PERSPECTIVE

The Occupational Skill Standards Act (PA 87-1210) established the nine-member Illinois Occupational Skill Standards and Credentialing Council (IOSSCC). Members of the IOSSCC represent business, industry and labor and are appointed by the Governor or State Superintendent of Education. The IOSSCC, working with the Illinois State Board of Education, Illinois Community College Board, Illinois Board of Higher Education, Illinois Department of Employment Security and Illinois Department of Commerce and Community Affairs, has created a common vision for workforce development in Illinois.

VISION

It is the vision of the IOSSCC to add value to Illinois' education and workforce development system by developing and supporting the implementation of a statewide system of industry defined and recognized skill standards and credentials for all major skilled occupations that provide strong employment and earnings opportunities.

The IOSSCC endorses occupational skill standards and credentialing systems for occupations that

- require basic workplace skills and technical training,
- provide a large number of jobs with either moderate or high earnings, and
- provide career advancement opportunities to related occupations with moderate or high earnings.

Subcouncils and Standards Development Committees

Under the direction of the IOSSCC, and in cooperation with industry organizations and associations, industry subcouncils have been formed to review, approve and promote occupational skill standards and credentialing systems. The industry subcouncils are: Agriculture and Natural Resources; Applied Science and Engineering;* Business and Administrative Services; Communications; Construction;* Education and Training Services;* Energy and Utilities; Financial Services; Health and Social Services; Hospitality; Legal and Protective Services;* Manufacturing; Marketing and Retail Trade; and Transportation, Distribution and Logistics. (*Indicates subcouncils identified for future development.)

Standards development committees are composed of business, labor and education representatives who are experts in the related occupational cluster. They work with the product developer to

- develop or validate occupational skill standards,
- identify related academic skills,
- develop or review assessment or credentialing approaches, and
- recommend endorsement of the standards and credentialing system to the industry subcouncil.

Expected Benefits

The intent of skill standards and credentialing systems is to promote investment in education and training and ensure that students and workers are trained to meet industry standards that are benchmarked to the state's major international competitors. Skill standards and credentialing systems have major benefits that impact students and workers, employers and educators in Illinois.

Student and Worker Benefits

- Help workers make better decisions about the training they need to advance their careers
- Allow workers to communicate more effectively to employers what they know and can do
- Improve long-term employability by helping workers move more easily among work roles
- Enable workers to help their children make effective academic and career and technical decisions

Employer Benefits

- Focus the investment in training and reduce training costs
- Boost quality and productivity and create a more flexible workforce
- Improve employee retention
- Improve supplier performance
- Enlarge the pool of skilled workers

Educator Benefits

- Keep abreast of a rapidly changing workplace
- Contribute to curriculum and program development
- Provide students with better career advice
- Strengthen the relationship between schools and local businesses
- Communicate with parents because educators have up-to-date information about industry needs

The IOSSCC is currently working with the Illinois State Board of Education and other state agencies to integrate the occupational standards with the Illinois Learning Standards which describe what students should know and be able to do as a result of their education. The IOSSCC is also working to integrate workplace skills—problem solving, critical thinking, teamwork, etc.—with both the Illinois Learning Standards and the Illinois Occupational Skill Standards.

IOSSCC Requirements for Occupational Skill Standards

Illinois Occupational Skill Standards define what an individual should know and the expected level of performance required in an occupational setting. The standards focus on the most critical work performances for an occupation or occupational area.

Endorsed Occupations

Any occupational skill standards and credentialing system seeking IOSSCC endorsement must

- represent an occupation or occupational cluster that meets the criteria for IOSSCC endorsement, including economic development, earnings potential and job outlook;
- address both content and performance standards for critical work functions and activities for an occupation or occupational area;
- ensure formal validation and endorsement by a representative group of employers and workers within an industry;
- provide for review, modification and revalidation by an industry group a minimum of once every five years;
- award credentials based on assessment approaches that are supported and endorsed by the industry and consistent with nationally recognized guidelines for validity and reliability;
- provide widespread access and information to the general public in Illinois; and
- include marketing and promotion by the industry in cooperation with the partner state agencies.

Recognized Occupations

Occupations that do not meet the earnings criteria for IOSSCC endorsement but are part of an occupational cluster that is being developed may be presented for recognition by the IOSSCC. IOSSCC members encourage individuals to pursue occupational opportunities identified as endorsed occupations. Examples of occupations that do not meet the endorsement criteria, but have been recognized by the IOSSCC are Certified Nurse Assistant and Physical Therapy Aide.

Skill Standards Components

Illinois Occupational Skill Standards must contain the following components:

- Performance Area
- Performance Skill
- Skill Standard
- Performance Elements
- Performance Assessment Criteria

The IOSSCC further identified three components (*Conditions of Performance, Work to be Performed and Performance Criteria)* of the Skill Standard component as critical work functions for an occupation or industry/occupational area. The sample format for Illinois Occupational Skill Standards on the following page provides a description of each component of an occupational skill standard.

The sample format also illustrates the coding at the top of each page identifying the state, fiscal year in which standards were endorsed, Subcouncil abbreviation, cluster abbreviation and standard number. For example, the twenty-fifth skill standard in the Industrial Maintenance - General Maintenance Cluster, which has been developed by the Manufacturing Subcouncil, would carry the following coding: IL.03.MFG.IM/GEN.25.

SUMMARY OF WORK TO BE PERFORMED. SUMMARY IS BRIEF AND BEGINS WITH AN ACTION VERB.

IL.FY.SUBCOUNCIL. CLUSTER. STANDARD NO.

PERFORMANCE AREA

SKILL STANDARD

CONDITIONS OF PERFORMANCE

A comprehensive listing of the information, tools, equipment and other resources provided to the person(s) performing the work.

WORK TO BE PERFORMED

An overview of the work to be performed in demonstrating the performance skill standard. This overview should address the major components of the performance. The detailed elements or steps of the performance are listed under "Performance Elements."

PERFORMANCE CRITERIA

The assessment criteria used to evaluate whether the performance meets the standard. Performance criteria specify product/outcome characteristics (e.g., accuracy levels, appearance, results, etc.) and process or procedure requirements (e.g., safety requirements, time requirements, etc.).

PERFORMANCE ELEMENTS

Description of the major elements or steps of the overall performance and any special assessment criteria associated with each element.

PERFORMANCE ASSESSMENT CRITERIA

Listing of required testing, certification and/or licensing.

Product and process used to evaluate the performance of the standard.

PRODUCT

Description of the product resulting from the performance of the skill standard.

PROCESS

Listing of steps from the Performance Elements which must be performed or the required order or performance for meeting the standard.

I. Developmental Process and Occupational Definitions

A. Developmental Process

After reviewing the current labor market information, the Manufacturing Subcouncil recommended the development of skill standards for occupations in the general industrial maintenance industry. The identified career, general industrial maintenance, meets the criteria established by the Illinois Occupational Skill Standards and Credentialing Council (IOSSCC) for performance skill standard development, education and training requirements, employment opportunities, earnings potential and career opportunities. A product developer knowledgeable about general industrial maintenance began the process of performance skill identification. The product developer prepared an outline and framework designed to address the major skills expected in the workplace. The framework addresses skill requirements common to general industrial maintenance.

The subcouncil recommended that the final skill standards product be presented to the IOSSCC. The IOSSCC reviewed the skill standards and met with the product developer, state liaison and chair of the subcouncil. Based on the review, the IOSSCC voted to endorse the Industrial Maintenance – General Maintenance Cluster skill standards.

1. Resources

Job descriptions from companies, qualification standards and competencies listed in related state and national maintenance programs were reviewed. Maintenance personnel including industrial maintenance, mechanical maintenance, machine repair and supervisory maintenance personnel were consulted. Educational texts used by high schools, colleges and trade schools were also referenced.

2. Standards Development Committee

A standards development committee composed of educators and experienced general industrial maintenance workers was convened. The framework, initial outline, matrix and draft skill standards were presented to the standards development committee for review, revision, adjustment and validation. Additional skill standard statements with performance elements and assessment criteria were developed in accordance with the direction established by the IOSSCC and were presented to the standards development committee for review and revision.

B. Occupational Definitions

General industrial maintenance workers perform work involving skills in many different crafts to keep machines and equipment or the structure of an establishment including the outside grounds in repair. They must have general knowledge and skills in the areas of plumbing, electrical and mechanical maintenance, heating and air-conditioning systems and construction. In addition, new buildings sometimes have computer-controlled systems requiring general maintenance workers to acquire basic computer skills.

General industrial maintenance workers may work in small establishments where they are often the only maintenance worker and do all repairs except for very large or difficult jobs. In larger establishments, their duties may be limited to the general maintenance of everything in a workshop or a particular area.

General industrial maintenance workers inspect and diagnose problems and determine the best way to correct them, often checking blueprints, repair manuals and parts catalogs.

1. **Apprentice** is the entry-level position. Apprentices have a basic foundation of maintenance skills and knowledge but have little on-the-job experience. They can perform some tasks independently but usually work as a helper for the journeyman. The apprentice performs basic maintenance tasks while receiving on-the-job training for more advanced skills. There is normally a formal arrangement that specifies the length of time and skills to be mastered for promotion to journeyman.

2. **Journeyman** is capable of performing all industrial maintenance tasks. Journeymen have the technical knowledge and hands-on skills to maintain the facility and its related equipment. They have typically completed an apprentice training program, have significant job experience and are relied upon to make decisions concerning maintenance issues.

3. **Supervisor** oversees the overall maintenance of the facility. Supervisors are responsible for the effectiveness of the industrial maintenance department. They determine maintenance priorities, procedures and work quality standards. Supervisors combine technical, personnel and business skills in daily decision-making. Their responsibilities may include training of apprentices, supervision of journeymen, preparation of documentation and personnel related tasks. They may occasionally be required to perform journeyman tasks.

II. Employment and Earnings Opportunities

A. Education and Training Requirements

Training time for general industrial maintenance can range from a few weeks of school or on-the-job training for low skilled positions to several years of combined school and on-the-job training for highly skilled jobs. Most general industrial maintenance workers learn their skills informally on the job. They start as helpers, watching and learning from skilled maintenance workers. Formal training is available in high schools, vocational schools, vocational-technical institutions and community colleges.

Many employers prefer applicants who have a high school diploma or GED. High school courses in mechanical drawing, electricity, woodworking, blueprint reading, science, mathematics and computers are useful. Community colleges offer courses leading to an entry level certificate in industrial maintenance and often offer an associate degree in industrial maintenance technology. Industrial unions may require an apprenticeship training program that combines classroom-based learning with on-the-job training. The armed forces offer maintenance training as well. Some employers provide training to help general industrial maintenance workers improve their skills with courses in blueprint reading, shop mathematics, mechanical drawing, physics, electronics, mechanical power transmission, chemistry, metallurgy and basic computers.

Many general industrial maintenance workers in large organizations advance to maintenance supervisor or to one of the more specialized crafts such as electrician, heating and air-conditioning mechanic or plumber. Within small organizations, promotion opportunities are limited.

Mechanical aptitude, ability to use shop math and manual dexterity are important. Good health is necessary because the job involves much walking, standing, reaching and heavy lifting. Difficult jobs require problem-solving ability, and many positions require the ability to work without direct supervision.

B. Employment Opportunities

General industrial maintenance workers are employed in almost every industry. In Illinois it is a large occupation with about 1,300 job openings expected annually. This occupation has a high rate of turnover and many job openings should result from the need to replace workers who transfer to other occupations or stop working for other reasons.

C. Earnings Opportunities

Earnings increase as individuals advance from apprentices to journeymen and supervisors.

	Annual Earnings 2001	
	Entry	Experienced
General Maintenance Worker	$21,025	$41,700

Sources: *2001 Occupational Employment Statistics: Wage Data, Occupational Projections 2010, LMI Source, and Horizons Career Information System,* Illinois Department of Employment Security, Economic Information and Analysis Division and Bureau of Labor Statistics, Office of Employment Projections.

III. Assessment and Credentialing Systems

The IOSSCC recognizes that industry commitment for third-party assessment is beneficial and requests that each standards development committee and/or subcouncil identifies the most beneficial method for assessing the standards.

Many industrial companies have internal testing to determine hiring and promotion eligibility. Currently, there are no widely recognized agencies that provide industry-wide certification or credentialing.

IV. Industry Support and Commitment

The primary areas currently identified for industry support and commitment of occupational skill standards are development, updating and marketing. Business and industry partners may identify future uses of occupational skill standards such as credentialing/certification, career development of employees and specifications for outsource training programs.

A. Industry Commitment for Development and Updating

1. The development of skill standards for general industrial maintenance was achieved by the Manufacturing Subcouncil and the standards development committee. Names of the persons serving on the subcouncil and the standards development committee are located in the appendices.

2. In developing the products, the following steps were completed:

   a. Identification and prioritization of a career ladder, identifying jobs by name
   b. Review of resources
   c. Development of draft matrix of performance standards
   d. Development of a performance standard that was identified on the matrix
   e. Convening of standards development committee of incumbent workers
   f. Review, validation and approval of skill standards by the standards development committee
   g. Review and approval of standards by subcouncil
   h. Endorsement of skill standards by the IOSSCC

B. Industry Commitment for Marketing

The Manufacturing Subcouncil is committed to marketing and obtaining support and endorsement from the leading industry associations impacted by the skill standards. Upon recognition/endorsement of the standards by the IOSSCC, the subcouncil strongly recommends that professional trade groups, academic groups, etc. develop and provide an in-service/seminar package to promote skill standard awareness and to obtain full industry support and commitment for the development of a full industry marketing plan.

The Manufacturing Subcouncil encourages the availability of skill standards to the public including learners, parents, workers, educators at all levels, employers and industry personnel.

ASSUMPTIONS FOR INDUSTRIAL MAINTENANCE GENERAL MAINTENANCE CLUSTER SKILL STANDARDS

Skill standards assume that individuals have received education and/or training in a setting such as a secondary, postsecondary and/or apprenticeship/on-the-job training program and have the background knowledge necessary for performing the skill standards contained in this publication. The education and/or training includes instruction for the proper handling and operation of materials, tools and equipment required for performing the skills including the purpose of use, when to use, how to use and any related safety issues. The instructional/training program must adhere to all local, state and federal licensing and/or certification requirements as set by law, if applicable.

The Industrial Maintenance General Maintenance Cluster Standards Development Committee developed these skill standards based on the following assumptions:

1. Workplace skills (employability skills) are expected of the individual. Socialization skills needed for work are related to lifelong career experience and are not solely a part of the initial schooling process. These are not included with this set of statements.
2. Specific policies and procedures of the work site will be made known to the individual and will be followed.
3. Time elements outlined for the skill standards result from the experience and consideration of the panel of experts who made up the standards development committee.
4. Skills will progress from simple to complex. Once a skill has been successfully completed, it will be incorporated into more complex skills.
5. Skill standards describe the skill only and do not detail the background knowledge or theory related to the particular skill base. Although the skill standard enumerates steps to successful demonstration, rote approaches to the outcomes are not prescribed.
6. Skills will be completed in an expedient and safe manner.
7. Skill standards are selected because they meet workplace needs and are designed to meet professional standards of practice.
8. Skill standards do not replace, supersede or substitute for procedure manuals.
9. Skill standards do not supersede or take the place of industry certification or graduation from an accredited program of study.
10. Skills are written from the perspective that equipment is available on time with no reduction in performance.
11. Individuals have received timely and proper training regarding all safety issues including the handling of hazardous materials.
12. All tasks require strict adherence to personal and environmental safety practices concerning clothing, breathing equipment, hand and air tool usage, handling chemicals and proper ventilation and disposal of chemicals/materials in accordance with local, state and federal regulations.
13. Individuals have received instruction in reading blueprints/drawings and schematics.

PERFORMANCE SKILL LEVELS

	APPRENTICE	JOURNEYMAN	SUPERVISOR
GENERAL BUSINESS			
Develop Maintenance Schedule			•
Manage Working Relationships with Customers			•
Maintain Budget			•
Order Materials and Supplies		•	•
Maintain Storeroom	•	•	
Follow Preventive Maintenance Program	•	•	•
Determine Quality Requirements		•	•
Schedule Maintenance Staff			•
Monitor Work of Subcontractors			•
Update Job Requirements			•
SAFETY AND ENVIRONMENT			
Inspect Facility for Code Violations		•	•
Store and Maintain Hazardous Materials	•	•	
Supervise Facilities Housekeeping			•
Follow Accident/Incident Response Procedures			•
Maintain Emergency Response Equipment		•	
Follow Proper Disposal Procedures	•	•	
Perform Safety and Security Checks	•	•	•
Perform Outdoor Maintenance	•	•	
Maintain Fencing	•	•	
Maintain Parking Lot	•	•	
GENERAL MAINTENANCE			
Set Up Ladders and Scaffolding	•	•	
Maintain Facility Drawings, Blueprints and Records			•
Repair Basic Welded Steel Structures		•	
Repair Sheet Metal	•	•	
Move Heavy Objects	•	•	
CONSTRUCTION			
Paint Exterior and Interior Surfaces	•	•	
Repair Structures, Walls and Ceilings	•	•	
Maintain Roofs and Gutters	•	•	
Repair Windows and Glass	•	•	
Build/Erect or Modify Wood and Metal Structures	•	•	
Repair Concrete	•	•	
Repair Floors	•	•	
Install/Repair Door Locks and Hardware	•	•	

PERFORMANCE SKILL LEVELS

	APPRENTICE	JOURNEYMAN	SUPERVISOR
PLUMBING AND PIPING			
Repair Toilet and Sink Fixtures, Faucets and Valves	•	•	
Remove Drain Clogs	•	•	
Install New Piping	•	•	
Inspect Fire Sprinkler Systems		•	•
Monitor Sewer Systems		•	
Repair Gas and Water Lines		•	
Maintain Water Heater		•	
MECHANICAL MAINTENANCE			
Install/Repair Safety Guards	•	•	
Maintain Drive Belts and Pulleys	•	•	
Maintain Roller Chains and Sprockets	•	•	
Maintain Bearings		•	
Lubricate Mechanisms	•		
Maintain Air Compressors		•	
Maintain Centrifugal Pumps		•	
Maintain Coupling Alignment		•	
Maintain Compressed Gas Cylinder System		•	
Maintain Pneumatic Systems		•	
Maintain Hydraulic Systems		•	
Maintain Backup Power Generator		•	
ELECTRICAL MAINTENANCE			
Repair or Replace Lighting and Fixtures	•	•	
Troubleshoot and Repair Faulty Electrical Circuits		•	
Install Conduit and Wiring	•	•	
Install Electrical Fixtures, Switches and Outlets	•	•	
Maintain Motors and Motor Starters		•	
Install and Repair Basic Electrical Appliances	•	•	
Maintain Fire Alarm System		•	
Maintain Security Alarm Systems		•	
Maintain Telephone System		•	
HEATING, VENTILATION, AIR CONDITIONING AND REFRIGERATION (HVAC/R)			
Monitor Energy Management Systems		•	
Maintain Air Conditioning System		•	
Evaluate Control Circuit Fuse and Replace		•	
Evaluate Thermostat Temperature Control and Operation		•	
Test for and Repair Refrigerant Leaks		•	
Replace Condenser Fan Blade	•	•	

PERFORMANCE SKILL LEVELS

HEATING, VENTILATION, AIR CONDITIONING AND REFRIGERATION (HVAC/R) *(Continued)*	APPRENTICE	JOURNEYMAN	SUPERVISOR
Evaluate Thermocouple and Replace		•	
Evaluate Spark Ignitor and Replace		•	
Evaluate Hot Surface Ignitor and Replace		•	
Evaluate Gas Valve and Replace		•	
Inspect Belt Drive Blower Shaft, Bearings and Pulleys and Lubricate or Replace	•	•	
Inspect Primary Heat Exchanger and Clean or Replace		•	
Inspect Main Burner and Orifice and Clean or Replace	•	•	
Operate and Maintain Boiler		•	
Monitor Steam System Operation		•	
Maintain Steam Valves and Traps		•	

The matrix indicates the occupational title whose primary responsibility it is to perform a particular skill. Where it is indicated that both an apprentice and a journeyman perform the same skill, the apprentice normally performs the more basic elements of the skill while the journeyman performs the more complex elements.

DEVELOP MAINTENANCE SCHEDULE.

GENERAL BUSINESS

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Preventive/predictive maintenance requirements
- Computer/printer/manuals
- Appropriate software/manuals
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures

WORK TO BE PERFORMED

Develop maintenance schedule.

PERFORMANCE CRITERIA

Maintenance schedule is developed according to manufacturers' instructions and company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on amount of maintenance work to be performed.

PERFORMANCE ELEMENTS

1. Identify routine tasks to be completed.
2. Identify tasks required for preventive/predictive maintenance.
3. Identify lubrication requirements according to manufacturers'/company's operating instructions.
4. Review equipment histories to find evidence of intermittent or chronic problems.
5. Review repair histories to see if correct repairs were done in the past and to determine current repair needs.
6. Ask customer appropriate questions to determine needs and requirements.
7. Identify potential problems with equipment prior to breakdown.
8. Identify tasks to correct potential problems with suspect equipment.
9. Identify parts needing routine replacement or maintenance.
10. Determine availability of required replacement parts and supplies.
11. Collect and analyze work order(s).
12. Determine tasks required to complete work order(s).
13. Identify job safety issues.

14. Specify procedures to meet OSHA and EPA requirements.
15. Determine the required completion dates.
16. Prioritize actions required.
17. Input data into scheduling software.
18. Review software results for correctness.
19. Determine schedule according to company procedures to minimize downtime, considering customer usage, production needs, output, and critical equipment.
20. Issue work order(s) to complete scheduled tasks.
21. Follow up work order(s) to determine status and completion of tasks.
22. Document the maintenance performed and update schedule.
23. Provide feedback to customer.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All local, state and federal regulations are followed.

PRODUCT

Maintenance schedule is developed.

PROCESS

All performance elements for developing a maintenance schedule are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

MANAGE WORKING RELATIONSHIPS WITH CUSTOMERS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Record keeping materials
Work order(s)
Preventive/predictive maintenance requirements
Computer/printer/manuals
Appropriate software/manuals
Workforce availability data
QS/ISO standards
Company policy and procedures

WORK TO BE PERFORMED

Manage working relationships with customers.

PERFORMANCE CRITERIA

Working relationships with customers are managed according to company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on amount of customer service required.

PERFORMANCE ELEMENTS

1. Ask customer appropriate questions to determine needs, priorities and requirements.
2. Use conflict resolution techniques if necessary to maintain constructive relationship with customer.
3. Verify customer needs by inspection.
4. Identify potential safety hazards.
5. Identify issues requiring immediate resolution.
6. Identify action required to process customer request.
7. Obtain proper authorization and create work order(s).
8. Maintain database of customer service requests.
9. Advise customers of task status.
10. Ensure that action has been taken on behalf of the customer.
11. Acquire customer feedback.
12. Document maintenance performed and update records.

PERFORMANCE ASSESSMENT CRITERIA

QS/ISO standards are followed.

PRODUCT

Working relationships with customers are managed.

PROCESS

All performance elements for managing working relationships with customers are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

MAINTAIN BUDGET.

GENERAL BUSINESS

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Approved budget
Work order(s)
Preventive/predictive maintenance requirements
Computer/printer/manuals
Appropriate software/manuals
QS/ISO standards
Company policy and procedures

WORK TO BE PERFORMED

Maintain budget.

PERFORMANCE CRITERIA

Budget is maintained according to company policy and procedures.

Budget calculations are 100% accurate and complete.

Time required to complete the skill varies depending on size and complexity of budget.

PERFORMANCE ELEMENTS

1. Utilize record keeping software.
2. Select appropriate forms/records.
3. Estimate total expenses.
4. Make necessary adjustments to work planned to maintain budget.
5. Calculate actual costs.
6. Analyze cost data for accuracy and completeness.
7. Calculate variances by comparing actual costs with budgeted costs.
8. Make necessary adjustments for cost overruns.
9. Review budget data to determine areas where improvement is needed.

PERFORMANCE ASSESSMENT CRITERIA

QS/ISO standards are followed.

PRODUCT

Budget is maintained.

PROCESS

All performance elements for maintaining a budget are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Material requisitions
- Approved budget
- Work order(s)
- Preventive/predictive maintenance requirements
- Computer/printer/manuals
- Appropriate software/manuals
- QS/ISO standards
- Company policy and procedures

WORK TO BE PERFORMED

Order materials and supplies.

PERFORMANCE CRITERIA

Materials and supplies are ordered according to company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size of order.

PERFORMANCE ELEMENTS

1. Determine need for materials and supplies.
2. Identify the part numbers and specifications for the required materials and supplies.
3. Determine lead time requirements.
4. Determine order quantity.
5. Review budget to determine funding availability.
6. Create required documentation for purchase.
7. Determine best price and preferred supplier.
8. Negotiate with supplier to improve terms of order.
9. Order materials and supplies.
10. Follow up on order status.
11. Inspect materials and supplies.
12. Approve payment.
13. Complete paperwork.

PERFORMANCE ASSESSMENT CRITERIA

QS/ISO standards are followed.

PRODUCT

Materials and supplies are ordered.

PROCESS

All performance elements for ordering materials and supplies are critical and must be performed in sequence.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Inventory documentation
Repair history database
Maintenance supplies
Storage facilities
Work order(s)
Material Safety Data Sheets (MSDSs)
Manufacturers' instructions
Preventive/predictive maintenance requirements
Computer/printer/manuals
Appropriate software/manuals
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures

WORK TO BE PERFORMED

Maintain storeroom.

PERFORMANCE CRITERIA

Storeroom is maintained according to manufacturers' instructions and company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and quantity of materials stored.

PERFORMANCE ELEMENTS

1. Review maintenance schedule and documentation to determine need for materials and supplies storage.
2. Identify part numbers and specifications for materials and supplies to be stored.
3. Determine estimated usage and quantity to be stored.
4. Determine storage space required for each item.
5. Determine any special environmental storage requirements.
6. Determine any special security requirements.
7. Determine any hazardous materials requirements.
8. Arrange storage area efficiently based upon expected usage.
9. Identify and record the storage location of each item.
10. Move supplies as required.

11. Receive and issue materials.
12. Maintain inventory records of material usage.
13. Maintain security of storeroom to minimize theft.
14. Remove items that are no longer utilized.
15. Clean and organize storeroom.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All local, state and federal regulations are followed.

PRODUCT

Storeroom is maintained.

PROCESS

All performance elements for maintaining storeroom are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

FOLLOW PREVENTIVE MAINTENANCE PROGRAM.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Preventive/predictive maintenance requirements
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures

WORK TO BE PERFORMED

Follow preventive maintenance program.

PERFORMANCE CRITERIA

Preventive maintenance program is followed according to manufacturers' instructions and company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on amount of preventive maintenance being performed.

PERFORMANCE ELEMENTS

1. Maintain file on equipment manufacturers' documentation including operating and maintenance manuals.
2. Utilize equipment documentation to determine preventive maintenance requirements for each piece of equipment.
3. Determine frequency of preventive maintenance tasks.
4. Prioritize preventive maintenance requirements.
5. Determine overall preventive maintenance schedule.
6. Obtain necessary supplies and materials.
7. Coordinate with other departments to ensure all resources are on hand, access to equipment and parts are available as needed and disruptions to customer are minimized.
8. Secure appropriate tools, equipment and components required to complete the procedure.
9. Put on PPE.
10. Observe equipment during operation and compare to optimal equipment operations.
11. Identify equipment performance issues and potential causes.
12. Follow shutdown procedures.

13. Perform lockout/tagout procedure.
14. Perform preventive maintenance required on schedule.
15. Follow all safety procedures when doing repairs.
16. Follow preventive maintenance sheet procedures completely.
17. Remove lockout/tagout.
18. Restart equipment.
19. Monitor equipment to ensure that the corrective action solved the problem.
20. Perform housekeeping when job is finished.
21. Complete documentation of equipment repair and report any additional work requirements.
22. Revise preventive maintenance plan according to repair histories.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All local, state and federal regulations are followed.

PRODUCT

Preventive maintenance program is followed.

PROCESS

All performance elements for following preventive maintenance program are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

DETERMINE QUALITY REQUIREMENTS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Work order(s)
Preventive/predictive maintenance requirements
Personal protective equipment (PPE)
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures

WORK TO BE PERFORMED

Determine quality requirements for work to be performed.

PERFORMANCE CRITERIA

Quality requirements are determined according to manufacturers' instructions and company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on amount of quality requirements.

PERFORMANCE ELEMENTS

1. Determine level of customer requirements for each task.
2. Review equipment history for past maintenance and quality problems.
3. Determine quality level of code requirements.
4. Evaluate short-term verses long-term maintenance decisions that impact quality.
5. Evaluate alternate maintenance solutions which may improve quality.
6. Evaluate budget impacts and limitations to meeting quality requirements.
7. Determine inspection criteria to assure that quality requirements have been met.
8. Specify quality standards for each maintenance task.
9. Verify that maintenance work meets quality requirements.
10. Verify that customer requirements and satisfaction are met.
11. Revise quality requirements if necessary.
12. Complete documentation.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All local, state and federal regulations are followed.

PRODUCT

Quality requirements are determined.

PROCESS

All performance elements for determining quality requirements are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SCHEDULE MAINTENANCE STAFF.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Work order(s)
Record keeping materials
Base work force staffing
Salary budget
Union contract
Previous year staff hours
Maintenance schedule
List of holiday calendar shifts
Staff availability times
Staff skill levels documentation
Staff time off requests (e.g., vacation, sick leave, etc.)
Computer/printer/manuals
Appropriate software/manuals
QS/ISO standards
Local, state and federal standards/regulations
Company policy and procedures

WORK TO BE PERFORMED

Schedule maintenance staff to provide optimal coverage of maintenance schedule.

PERFORMANCE CRITERIA

Maintenance staff is scheduled according to company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies according to size of workforce to be scheduled.

PERFORMANCE ELEMENTS

1. Collect work order(s).
2. Determine tasks required to complete work order(s).
3. Determine tasks required to complete maintenance schedule.
4. Determine preventive/predictive maintenance tasks.
5. Estimate work force requirements to complete each task.
6. Total work force requirements to complete all tasks.
7. Determine required completion time of each task.
8. Determine latest start time of each task.
9. Prioritize tasks required.
10. Determine when required equipment and supplies will be available.
11. Create master schedule of prioritized tasks and task start times.

12. Modify schedule with alternate plans to include sufficient flexibility if tasks take longer and indicate fill-in work if tasks are shorter than expected.
13. Compare and balance work force hours needed to complete tasks to actual work force available.
14. Determine availability of staff to work taking into consideration vacation schedules, sick leave, training schedules, scheduling limitations of staff, etc.
15. Assign tasks to staff according to skill levels and availability.
16. Schedule tasks by appropriate time frame.
17. Post schedules.
18. Adjust schedules to account for absent staff, scheduling errors, current events, etc.
19. Document maintenance performed and update master schedule accordingly.

PERFORMANCE ASSESSMENT CRITERIA

QS/ISO standards are followed.

All local, state and federal regulations are followed.

PRODUCT

Maintenance staff is scheduled to provide optimal coverage of maintenance schedule.

PROCESS

All performance elements for scheduling maintenance staff are critical.
Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Contract documentation
Quality requirements
Vendor data
Personal protective equipment (PPE)
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures

WORK TO BE PERFORMED

Monitor work of subcontractors to ensure compliance with contract.

PERFORMANCE CRITERIA

Work of subcontractors is monitored according to manufacturers' instructions and company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies according to scope of subcontract.

PERFORMANCE ELEMENTS

1. Identify contracts that require monitoring.
2. Obtain information from suppliers and vendors to ensure proper work specifications and performance criteria are met.
3. Determine subcontractor's contract requirements.
4. Provide accurate drawings, specifications and documentation to the subcontractor.
5. Verify that materials, equipment and supplies comply with job specifications prior to use by subcontractor.
6. Observe subcontractor's work and progress at the job site.
7. Evaluate subcontractor's progress and completion schedule and budget compliance.
8. Evaluate actual performance to contract requirements.
9. Review subcontractor's work for plant safety, OSHA, EPA, quality and code compliance.
10. Identify any corrective actions required.
11. Assist subcontractor in overcoming obstacles created by others.
12. Document activities and as-built modifications and findings.
13. Confirm all agreements in writing.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All local, state and federal regulations are followed.

PRODUCT

Work of subcontractors is monitored.

PROCESS

All performance elements for monitoring work of subcontractors are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Work order(s)
Preventive/predictive maintenance requirements
Personal protective equipment (PPE)
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures

WORK TO BE PERFORMED

Update job requirements to meet changing skill requirements.

PERFORMANCE CRITERIA

Job requirements are updated according to manufacturers' instructions and company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies according to number of job requirements needing to be updated.

PERFORMANCE ELEMENTS

1. Identify skills needed to perform each maintenance task.
2. Identify changes in workplace regulations.
3. Identify required certifications and registrations.
4. Identify changes in technology that require skill updates.
5. Categorize skills into appropriate job levels and classifications.
6. Identify changes in skill requirements for each classification.
7. Identify areas where cross training is desirable.
8. Identify individual skills requiring additional training.
9. Develop training to update necessary skills in an efficient, effective and appropriate manner.
10. Provide training to update identified skills.
11. Assess trainees to determine that appropriate skills have been learned.
12. Document that training is conducted correctly and that training records are updated.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All local, state and federal regulations are followed.

PRODUCT

Job requirements are updated.

PROCESS

All performance elements for updating job requirements are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

INSPECT FACILITY FOR CODE VIOLATIONS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Appropriate facility documentation
- Record keeping materials
- Work request documentation
- Preventive maintenance requirements
- Certification/licensing documentation
- Building code requirements
- Inspection checklist
- Appropriate inspection documentation
- Personal protective equipment (PPE)
- Maintenance toolbox
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Inspect facility for code violations.

PERFORMANCE CRITERIA

Facility is inspected for code violations according to inspection checklist, manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on type of inspection.

PERFORMANCE ELEMENTS

1. Review code requirements, health, safety and environmental documentation and policies thoroughly and regularly.
2. Plan code inspections in advance based upon schedules and requirements.
3. Put on PPE.
4. Secure appropriate tools, equipment and components required to complete inspection.
5. Observe equipment during operation.
6. Perform checklist inspections.

7. Identity potential code violations.
8. Document inspection results.
9. Correct potential code violations.
10. Document and store correction activities.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All local, state and federal regulations are followed.

PRODUCT

Facility is inspected for code violations.

PROCESS

All performance elements for inspecting facility for code violations are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

STORE AND MAINTAIN HAZARDOUS MATERIALS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Record keeping materials
- Preventive/predictive maintenance requirements
- Training and certification on relevant emergency and first aid procedures
- Hazardous materials
- Appropriate storage containers and facilities
- Manufacturers' instructions
- Equipment
- Supplies
- Labels
- Disaster policy and procedures
- Personal protective equipment (PPE)
- Hazardous Materials Information Sheets (HMISs)
- Material Safety Data Sheets (MSDSs)
- QS/ISO standards
- Insurance requirements
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) standards/requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Store and maintain hazardous materials.

PERFORMANCE CRITERIA

Hazardous materials are stored and maintained according to manufacturers' specifications, company policy and procedures and industry standards.

All safety standards/regulations are adhered to 100% of the time.

Time required to complete the skill varies depending on type of hazardous materials.

PERFORMANCE ELEMENTS

Note: Individuals have received training and certification on relevant hazardous materials procedures prior to performing this skill.

1. Review health, safety and environmental documentation and policies thoroughly and regularly.
2. Review all hazardous materials procedures and guidelines.

3. Review MSDSs.
4. Put on PPE.
5. Secure appropriate tools, equipment and components required to complete procedure.
6. Identify hazardous materials.
7. Store hazardous materials in properly labeled container utilizing appropriate equipment.
8. Store hazardous materials in the proper location utilizing appropriate equipment.
9. Inspect storage areas for compliance with all relevant, health, safety and environmental laws and regulations.
10. Identify, report and monitor potential hazards.
11. Correct potential hazards.
12. Clean up work space after use.
13. Clean clothing and body after contact with hazardous materials.
14. Document and store information regarding storage and maintenance procedures performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Insurance requirements are followed.

All local, state and federal regulations are followed.

PRODUCT

Hazardous materials are properly stored and maintained.

PROCESS

All performance elements for storing and maintaining hazardous materials are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SUPERVISE FACILITIES HOUSEKEEPING.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Preventive/predictive maintenance requirements
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Supervise facilities housekeeping.

PERFORMANCE CRITERIA

Facilities housekeeping is supervised according to company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies according to size of facility.

PERFORMANCE ELEMENTS

1. Identify the housekeeping tasks required.
2. Develop a housekeeping plan.
3. Ensure that proper housekeeping equipment is used.
4. Ensure that proper cleaning supplies are used.
5. Ensure that PPE is available.
6. Determine waste disposal plan.
7. Determine recycling plan.
8. Develop and implement a periodic inspection plan.
9. Verify compliance with safety and environmental standards.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Facilities housekeeping is supervised.

PROCESS

All performance elements for supervising facilities housekeeping are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

FOLLOW ACCIDENT/INCIDENT RESPONSE PROCEDURES.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Accident/incident response policy and procedures
- Accident/incident-specific checklist
- Job safety analyses
- First aid kit
- Telephone
- Annual Occupational Safety and Health Administration (OSHA) record log of work-related employee injuries and illnesses
- Accident/incident reports and logbooks
- Disaster policy and procedures (company or other)
- Training and certification on relevant emergency and first aid procedures
- Emergency call list (e.g., police departments, fire departments, management personnel, emergency response team, ambulance services, etc.)
- Emergency and safety equipment and supplies
- Operation/service manuals
- Personal protective equipment (PPE)
- Hazardous Materials Information Sheets (HMISs)
- Material Safety Data Sheets (MSDSs)
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) standards/requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Insurance requirements

WORK TO BE PERFORMED

Follow accident/incident response procedures.

PERFORMANCE CRITERIA

Accident/incident response procedures are followed according to company policy and procedures and disaster policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on type of accident/incident.

PERFORMANCE ELEMENTS

1. Assess accident/incident situation.
2. Determine seriousness of accident/incident.
3. Call emergency personnel if necessary.
4. Put on PPE.

5. Assist individual(s) by most appropriate means.
6. Establish communication checkpoints as required.
7. Direct individuals to appropriate safe areas as required.
8. Use emergency and other safety equipment as required.
9. Report accident/incident to designated individual(s).
10. Comply with HMISs, MSDSs, and EPA and OSHA standards/regulations.
11. Comply with all state, federal and local standards/regulations.
12. Comply with company policies and procedures.
13. Complete accident/incident documentation.
14. Forward accident and injury data to appropriate personnel for inclusion in OSHA recordables.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Insurance requirements are followed.

All local, state and federal regulations are followed.

PRODUCT

Accident/incident response procedures are followed.

PROCESS

All performance elements for following accident/incident response procedures are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

MAINTAIN EMERGENCY RESPONSE EQUIPMENT.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Emergency response equipment maintenance schedule
- Emergency response equipment checklist
- Record keeping materials
- Work request documentation
- Preventive/predictive maintenance requirements
- Emergency response equipment and supplies
- Manufacturers' instructions
- Accident/incident reports and logbooks
- Disaster policy and procedures
- Personal protective equipment (PPE)
- Hazardous Materials Information Sheets (HMISs)
- Material Safety Data Sheets (MSDSs)
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) standards/requirements
- Local, state and federal standards/regulations
- National Fire Protection Association (NFPA) standards
- Company policy and procedures
- Insurance requirements

WORK TO BE PERFORMED

Maintain emergency response equipment.

PERFORMANCE CRITERIA

Emergency response equipment is maintained according to maintenance schedule and checklists, manufacturers' instructions and company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on type of emergency response equipment maintained.

PERFORMANCE ELEMENTS

1. Put on PPE.
2. Perform inspection activities per inspection schedule.
3. Maintain appropriate fire extinguishers and fire protection equipment per NFPA standards.
4. Identify locations of emergency response equipment.
5. Inspect emergency response equipment per checklist.

6. Monitor equipment regularly to ensure that it is operating correctly, has current certification and is ready for use.
7. Replace or repair equipment in noncompliance with checklist.
8. Complete documentation of findings and activities.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

NFPA standards are followed.

QS/ISO standards are followed.

Insurance requirements are followed.

All local, state and federal regulations are followed.

PRODUCT

Emergency response equipment is maintained in ready condition.

PROCESS

All performance elements for maintaining emergency response equipment are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

FOLLOW PROPER DISPOSAL PROCEDURES.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Materials requiring disposal
- Appropriate disposal containers
- Recycling policy
- Manufacturers' instructions
- Disposal equipment and supplies
- Disaster policy and procedures
- Personal protective equipment (PPE)
- Hazardous Materials Information Sheets (HMISs)
- Material Safety Data Sheets (MSDSs)
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) standards/requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Insurance requirements

WORK TO BE PERFORMED

Follow proper disposal procedures.

PERFORMANCE CRITERIA

Proper disposal procedures are followed according to manufacturers' instructions and company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on type of disposal.

PERFORMANCE ELEMENTS

Note: All hazardous materials requiring third party handling have been identified. Individuals have received training and certification on relevant hazardous materials procedures prior to performing this skill.

1. Utilize a certified party to dispose of hazardous materials requiring third party identification and handling.
2. Put on PPE.
3. Mark materials needing disposal for removal.
4. Identify, label and move hazardous materials to designated location.
5. Identify, label and move biohazard materials to designated location.
6. Identify and separate recyclable materials into appropriate bins.
7. Identify, reclaim or recycle oils and cutting fluids.

8. Disassemble hardware for recycling per company policy and procedures.
9. Remove disposed materials to proper disposal facility.
10. Perform follow-up monitoring to assure proper disposal.
11. Identify and correct potential EPA violations.
12. Complete documentation as required.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Insurance requirements are followed.

All local, state and federal regulations are followed.

PRODUCT

Proper disposal procedures are followed.

PROCESS

All performance elements for following proper disposal procedures are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

PERFORM SAFETY AND SECURITY CHECKS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Safety and security checklists
- Key control policy and procedures
- Record keeping materials
- Work request documentation
- Preventive/predictive maintenance requirements
- Security equipment (e.g., alarm systems and monitors)
- Loss prevention and asset protection procedures
- Security and safety log
- Security signage
- Property policy and procedures
- Personal protective equipment (PPE)
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards
- Insurance requirements

WORK TO BE PERFORMED

Perform safety and security checks.

PERFORMANCE CRITERIA

All safety and security checks are performed according to company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on type of safety and security checks performed. Identification of potential risks is ongoing.

PERFORMANCE ELEMENTS

1. Identify, report and correct conditions that present a threat to health, safety and the environment.
2. Ensure that maintenance of security system is completed according to schedule.
3. Set/reset alarm systems.
4. Maintain security signage.
5. Maintain safety equipment (e.g., evacuation equipment, first aid kit, etc.).
6. Monitor property for nonauthorized activity.
7. Report all safety and security violations immediately to designated staff.

8. Protect property from theft.
9. Remove all objects located where they could cause injury or damage.
10. Clean up or temporarily cover all spills on floors and work surfaces.
11. Remove unsafe components from service.
12. Verify that evacuation plans for facility are posted.
13. Ensure that all exit signs, emergency lights and warning indicators are in working order.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Insurance requirements are followed.

All local, state and federal regulations are followed.

PRODUCT

Safety and security checks are performed.

PROCESS

All performance elements for performing safety and security checks are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Appropriate documentation
- Preventive/predictive maintenance requirements
- Personal protective equipment (PPE)
- Snow removal equipment
- Lawn mowing equipment
- Landscaping equipment
- Maintenance toolbox
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures

WORK TO BE PERFORMED

Perform outdoor maintenance.

PERFORMANCE CRITERIA

Outdoor maintenance is performed according to manufacturers' instructions and company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on type and amount of outdoor maintenance required.

PERFORMANCE ELEMENTS

1. Determine and obtain tools and equipment needed.
2. Put on PPE.
3. Take preventive measures to prevent accidents during inclement weather.
4. Remove snow and ice from walkways and parking lots when required.
5. Remove trash and debris.
6. Operate lawn mowing and landscaping equipment when required.
7. Care for plantings, shrubs, trees and lawns.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All local, state and federal regulations are followed.

PRODUCT

Outdoor maintenance is performed.

PROCESS

All performance elements for performing outdoor maintenance are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Record keeping materials
Preventive/predictive maintenance requirements
Work request documentation
Appropriate facility documentation
Building codes
Personal protective equipment (PPE)
Replacement and repair materials
Maintenance toolbox
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Insurance requirements

WORK TO BE PERFORMED

Maintain fencing.

PERFORMANCE CRITERIA

Fencing is maintained according to work request documentation, manufacturers' instructions and company policy and procedures.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on type and amount of fencing.

PERFORMANCE ELEMENTS

1. Review work request documentation to determine work to be performed.
2. Plan project to be completed in the most efficient manner.
3. Order required supplies and materials.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Remove damaged fencing.
7. Set up temporary fencing as required.
8. Install repair material.
9. Install fence posts if required.
10. Stretch fencing if required.

11. Permanently attach fencing to posts.
12. Maintain security system if required.
13. Install appropriate signage.
14. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Insurance requirements are followed.

All local, state and federal regulations are followed.

PRODUCT

Fencing is maintained.

PROCESS

All performance elements for maintaining fencing are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Record keeping materials
- Work request documentation
- Appropriate facility documentation
- Preventive/predictive maintenance requirements
- Building codes
- Personal protective equipment (PPE)
- Repair materials
- Paint striping equipment
- Signage materials
- Maintenance toolbox
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Americans with Disabilities Act (ADA) regulations
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain parking lot.

PERFORMANCE CRITERIA

Parking lot is maintained according to building codes, ADA requirements, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of parking lot maintained.

PERFORMANCE ELEMENTS

1. Review work request documentation to determine work to be performed.
2. Plan project to be completed in most efficient manner.
3. Order required supplies and materials.
4. Put on PPE.
5. Determine and obtain tools and equipment needed.
6. Clean up oil and fluid spills.
7. Repair concrete defects.
8. Repair asphalt defects.
9. Seal expansion joints.
10. Apply sealer or coatings.

11. Create/maintain handicap parking areas.
12. Paint striped parking areas.
13. Install/maintain parking blocks.
14. Install/maintain signage.
15. Document maintenance performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All local, state and federal regulations are followed.

PRODUCT

Parking lot is maintained.

PROCESS

All performance elements for maintaining parking lot are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SET UP LADDERS AND SCAFFOLDING.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Scaffolding training
- Ladder safety training
- Preventive/predictive maintenance requirements
- Ladders and scaffolding equipment
- Maintenance toolbox
- Work order(s)
- Personal protective equipment (PPE)
- Fall protection equipment
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Insurance requirements

WORK TO BE PERFORMED

Set up ladders and scaffolding.

PERFORMANCE CRITERIA

Ladders and scaffolding are set up according to company policy and procedures and manufacturers' instructions.

Skill is performed with 100% accuracy.

Time required to complete the skill varies according to size of equipment and local conditions.

PERFORMANCE ELEMENTS

1. Survey site to determine conditions.
2. Inspect site for electrical hazards, fall hazards and falling object hazards in the work area.
3. Correct any safety hazards.
4. Inspect ladders and scaffolding prior to use.
5. Determine load and height requirements.
6. Put on PPE.
7. Select proper ladder or scaffolding equipment.
8. Prepare base surface to safely support scaffold or ladder.
9. Erect scaffold or ladder and level and square.
10. Secure scaffold or ladder as needed.
11. Utilize fall protection equipment as required.

12. Inspect setup and personnel for climbing safety.
13. Set up safety barrier around work site.
14. Clean up work site.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Insurance requirements are followed.

Local, state and federal regulations are followed.

PRODUCT

Ladders and scaffolding are set up.

PROCESS

All performance elements for setting up ladders and scaffolding are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

MAINTAIN FACILITY DRAWINGS, BLUEPRINTS AND RECORDS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

File storage facilities
Facility drawings, blueprints and records
Computer/printer/manuals
Appropriate software/manuals
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Maintain facility drawings, blueprints and records.

PERFORMANCE CRITERIA

Facility drawings, blueprints and records are maintained according to company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies according to number of facility drawings, blueprints and records.

PERFORMANCE ELEMENTS

1. Identify facility drawings, blueprints and records that are required for maintenance.
2. Identify records that are required by regulations.
3. Select method of storage.
4. Determine filing system.
5. Keep documents clean and dry.
6. Fold drawings in such a way that title block and sheet identification are on front.
7. File document in its proper location and sequence.
8. Utilize document checkout system.
9. Update facility drawings and blueprints with latest revision levels.
10. Collect and record data to keep records up-to-date.
11. Utilize computer database system.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Facility drawings, blueprints and records are maintained.

PROCESS

All performance elements for maintaining facility drawings, blueprints and records are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

REPAIR BASIC WELDED STEEL STRUCTURES.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Work order(s)
Maintenance toolbox
Preventive/predictive maintenance requirements
Welding machine and supplies
Hot work permit
Primer and paint
Personal protective equipment (PPE)
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Repair basic welded steel structures.

PERFORMANCE CRITERIA

Basic welded steel structures are repaired according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies according to number and type of repairs needed.

PERFORMANCE ELEMENTS

Note: Certified structural engineer approval may be required.

1. Determine and obtain tools and equipment needed.
2. Put on PPE.
3. Observe equipment during operation.
4. Identify equipment performance issues and potential causes.
5. Follow shutdown procedures.
6. Perform lockout and tagout procedure.
7. Survey site to determine environmental conditions and correct potential safety hazards.
8. Set up safety barrier around work site.
9. Obtain hot work permit if required.
10. Remove structure to be repaired if required.

11. Review structure documentation to identify any critical dimensions or loading conditions.
12. Determine type and thickness of material if necessary.
13. Select welding process, weld size and filler material requirements.
14. Prepare area by removing paint and rust and damaged material.
15. Clamp or tack weld structure components in position.
16. Apply weld.
17. Inspect weld for quality and dimensional accuracy.
18. Grind weld and remove slag.
19. Clean and apply primer and paint.
20. Load test structure if required.
21. Reassemble structure.
22. Clean up work site.
23. Remove lockout/tagout when completed.
24. Return equipment to operation.
25. Check for proper operation.
26. Return tools and equipment to proper location.
27. Document maintenance performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Basic welded steel structures are repaired.

PROCESS

All performance elements for repairing basic welded steel structures are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Work order(s)
Maintenance toolbox
Preventive/predictive maintenance requirements
Sheet metal working equipment
Sheet metal supplies
Primer and paint
Personal protective equipment (PPE)
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Repair sheet metal.

PERFORMANCE CRITERIA

Sheet metal is repaired according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies according to number and type of repairs needed.

PERFORMANCE ELEMENTS

1. Determine and obtain tools and equipment needed.
2. Put on PPE.
3. Observe equipment during operation.
4. Identify equipment performance issues and potential causes.
5. Follow shutdown procedures.
6. Perform lockout and tagout procedure.
7. Survey site to determine environmental conditions and correct potential safety hazards.
8. Remove sheet metal to be repaired if required.
9. Review sheet metal documentation to identify any critical dimensions or environmental conditions.
10. Determine type and thickness of material.
11. Select sheet metal working processes needed to make repair.
12. Prepare area by removing paint and rust and damaged material.

13. Calculate setback for bend radius.
14. Lay out flat design on sheet metal.
15. Cut out sheet metal blank to size and shape.
16. Form sheet metal if required.
17. Weld sheet metal joints if required.
18. Attach fasteners to sheet metal.
19. Inspect for quality and dimensional accuracy.
20. Clean surface and apply primer and paint.
21. Reassemble sheet metal to equipment.
22. Clean up work site.
23. Remove lockout/tagout when completed.
24. Return equipment to operation.
25. Check for proper operation.
26. Return tools and equipment to proper location.
27. Document maintenance performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Sheet metal is repaired.

PROCESS

All performance elements for repairing sheet metal are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

MOVE HEAVY OBJECTS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Work order(s)
Maintenance toolbox
Moving and rigging equipment
Personal protective equipment (PPE)
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Move heavy objects.

PERFORMANCE CRITERIA

Heavy objects are moved according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies according to size and distance of the move.

PERFORMANCE ELEMENTS

1. Prepare new site location for equipment.
2. Determine weight of object being moved.
3. Plan route.
4. Identify and correct potential safety hazards along route.
5. Determine and obtain tools and equipment needed.
6. Put on PPE.
7. Prepare object to be moved.
8. Move load.
9. Set load in place.
10. Follow installation procedures; level, align and anchor if required.
11. Clean up work site.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Heavy objects are moved.

PROCESS

All performance elements for moving heavy objects are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Painting equipment
- Primer and paint
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Paint exterior and interior surfaces.

PERFORMANCE CRITERIA

Exterior and interior surfaces are painted according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies.

PERFORMANCE ELEMENTS

1. Identify painting tasks required.
2. Inspect painting area for potential safety hazards.
3. Determine if old paint contains lead.
4. Develop a painting plan.
5. Determine and obtain tools and equipment needed.
6. Select primer and paint.
7. Put on PPE.
8. Set up safety barrier around work site.
9. Set up ladders if required.
10. Set up drop cloths.
11. Clean surface to remove dirt.
12. Scrape existing surface to remove loose paint.
13. Repair surface defects.
14. Mask off areas and trim that should not be painted.

15. Apply primer and let dry.
16. Apply paint and let dry.
17. Inspect final coat and touch up as required.
18. Clean tools.
19. Dispose of cleaning solvents properly.
20. Clean up work site.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Exterior and interior surfaces are painted.

PROCESS

All performance elements for painting exterior and interior surfaces are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Power tools
- Ladder and scaffolding
- Painting equipment
- Repair materials
- Primer and paint
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Repair structures, walls and ceilings.

PERFORMANCE CRITERIA

Structures, walls and ceilings are repaired according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on number and types of repairs needed.

PERFORMANCE ELEMENTS

1. Identify repair tasks required.
2. Inspect work area for potential safety hazards and asbestos.
3. Develop repair plan.
4. Determine and obtain tools and equipment needed.
5. Select repair and replacement materials.
6. Set up safety barrier around work site.
7. Set up ladders if required.
8. Set up drop cloths.
9. Put on PPE.
10. Repair dry wall if required.
11. Repair siding if required.

12. Repair or replace ceiling tile if required.
13. Repair structural framing if required.
14. Repair wallpaper if required.
15. Repair paneling if required.
16. Repair trim if required.
17. Prime and paint repaired surfaces.
18. Inspect final product and touch up as required.
19. Clean tools.
20. Clean up work site.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Structures, walls and ceilings are repaired.

PROCESS

All performance elements for repairing structures, walls and ceilings are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Power tools
- Ladder and scaffolding
- Roofing materials
- Gutter materials
- Painting equipment
- Primer and paint
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain roofs and gutters.

PERFORMANCE CRITERIA

Roofs and gutters are maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of roofing and gutters and maintenance required.

PERFORMANCE ELEMENTS

1. Inspect roof and gutters and review inspection history.
2. Identify damaged areas to be repaired.
3. Determine repair tasks required.
4. Inspect work area for potential safety hazards.
5. Develop repair plan.
6. Determine and obtain tools and equipment needed.
7. Select repair and replacement materials.
8. Set up safety barrier around work site.
9. Set up ladders if required.
10. Put on PPE.

11. Patch roof if required.
12. Repair gutters if required.
13. Repair downspouts if required.
14. Remove damaged roofing materials if required.
15. Repair structural roofing if required.
16. Install underlayments if required
17. Install new roofing material if required.
18. Prime and paint gutters if required.
19. Verify effectiveness of repairs.
20. Clean tools.
21. Clean up work site.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Roofs and gutters are maintained.

PROCESS

All performance elements for maintaining roofs and gutters are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Work order(s)
Maintenance toolbox
Preventive/predictive maintenance requirements
Ladder and scaffolding
Replacement glass and hardware
Painting equipment
Primer and paint
Personal protective equipment (PPE)
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Repair windows and glass.

PERFORMANCE CRITERIA

Windows and glass are repaired according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on type and size of window being repaired.

PERFORMANCE ELEMENTS

1. Identify type of repair required.
2. Inspect window area for potential safety hazards.
3. Develop repair plan.
4. Determine type, thickness and size of replacement glass or window.
5. Determine and obtain tools and equipment needed.
6. Set up safety barrier around work site.
7. Set up ladders if required.
8. Set up drop cloths.
9. Put on PPE.
10. Repair or replace screen if required.
11. Remove and dispose of broken glass, if required, with extreme caution.
12. Clean and scrape window mounting surface.

13. Install replacement glass.
14. Prime and paint surface if required.
15. Repair or replace defective hardware.
16. Check for air and water leaks.
17. Clean tools.
18. Clean up work site.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Windows and glass are repaired.

PROCESS

All performance elements for repairing windows and glass are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

BUILD/ERECT OR MODIFY WOOD AND METAL STRUCTURES.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Blueprints or sketches
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Power tools
- Ladder and scaffolding
- Painting equipment
- Building materials
- Primer and paint
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Build/erect or modify wood and metal structures.

PERFORMANCE CRITERIA

Wood and metal structures are built/erected or modified according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of structure.

PERFORMANCE ELEMENTS

1. Study project plan and construction blueprints.
2. Inspect work area for potential safety hazards.
3. Develop work plan.
4. Determine and obtain tools and equipment needed.
5. Select building materials.
6. Set up safety barrier around work site.
7. Set up ladders and scaffolding, if required.
8. Put on PPE.
9. Lay out and mark critical dimensions and details.

10. Prepare foundation.
11. Cut materials to appropriate length.
12. Fit, fasten and assemble framing materials.
13. Measure and align for square and level.
14. Install roofing if required
15. Install exterior siding if required.
16. Install insulation if required.
17. Install utilities.
18. Install dry wall if required.
19. Prime and paint surfaces if required.
20. Inspect final product and touch up as required.
21. Clean tools.
22. Clean up work site.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Wood and metal structures are built/erected or modified.

PROCESS

All performance elements for building/erecting or modifying wood and metal structures are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Work order(s)
Maintenance toolbox
Preventive/predictive maintenance requirements
Concrete pouring and finishing equipment
Painting equipment
Concrete mix
Concrete coating and joint sealant
Personal protective equipment (PPE)
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Repair concrete.

PERFORMANCE CRITERIA

Concrete is repaired according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size of repairs needed.

PERFORMANCE ELEMENTS

1. Identify repair tasks required.
2. Inspect work area for potential safety hazards.
3. Develop repair plan.
4. Determine and obtain tools and equipment needed.
5. Select repair and replacement materials.
6. Set up safety barrier around work site.
7. Put on PPE.
8. Remove damaged concrete.
9. Apply concrete patching material to small areas if required.
10. Dig out and level base surface if required.
11. Install concrete forms if required.
12. Install re-bar if required.
13. Mix and prepare concrete.

14. Pour concrete.
15. Trowel concrete surface.
16. Allow concrete to properly cure.
17. Remove concrete forms.
18. Cut saw slots and expansion joints if required.
19. Fill expansion joints.
20. Apply coating material (e.g., sealer, paint, etc.).
21. Clean tools.
22. Clean up work site.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Concrete is repaired.

PROCESS

All performance elements for repairing concrete are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Painting equipment
- Flooring materials
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Repair floors.

PERFORMANCE CRITERIA

Floors are repaired according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of repairs needed.

PERFORMANCE ELEMENTS

1. Identify repair tasks required.
2. Inspect work area for potential safety hazards.
3. Develop repair plan.
4. Determine and obtain tools and equipment needed.
5. Select repair and replacement materials.
6. Set up safety barrier around work site.
7. Put on PPE.
8. Remove damaged material if required.
9. Prepare subsurface.
10. Install replacement carpet if required.
11. Install replacement floor tile if required.
12. Repair wooden floor if required.

13. Refinish to match appearance if required.
14. Check for trip hazards and loose product.
15. Clean tools.
16. Clean up work site.

PERFORMANCE ASSESSMENT CRITERIA

PRODUCT

Floors are repaired.

PROCESS

All performance elements for repairing floors are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

INSTALL/REPAIR DOOR LOCKS AND HARDWARE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Door locks and hardware
- Construction blueprints
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- Americans with Disabilities Act (ADA) requirements
- QS/ISO standards
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Install/repair door locks and hardware.

PERFORMANCE CRITERIA

Door locks and hardware are installed/repaired according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of locks and hardware.

PERFORMANCE ELEMENTS

1. Study project plan and construction blueprints.
2. Inspect work area for potential safety hazards.
3. Develop a work plan.
4. Determine and obtain tools and equipment needed.
5. Select hardware materials.
6. Put on PPE.
7. Set up safety barrier around work site.
8. Set up ladders if required.
9. Check lock or door unit for proper operation.
10. Disassemble lock unit.
11. Locate and replace worn or defective parts.
12. Assemble lockset.
13. Check and adjust hinges for proper door fit.

14. Check and adjust door closer operation.
15. Lubricate mechanisms if required.
16. Inspect final product and touch up paint if required.
17. Clean up work site.
18. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and ADA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Door locks and hardware are installed/repaired.

PROCESS

All performance elements for installing/repairing door locks and hardware are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

REPAIR TOILET AND SINK FIXTURES, FAUCETS AND VALVES.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Plumbing and valve supplies
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Repair toilet and sink fixtures, faucets and valves.

PERFORMANCE CRITERIA

Toilet and sink fixtures, faucets and valves are repaired according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on type of repair needed.

PERFORMANCE ELEMENTS

Note: Any repairs involving HVAC issues refer to the performance area HVAC/R.

1. Observe operation to identify problems.
2. Develop repair plan.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Select repair and replacement materials.
6. Set up safety barrier around work site and appropriate signs.
7. Put on PPE.
8. Replace battery and adjust sensors if necessary.
9. Shut off water.
10. Tighten fittings to prevent leaks if required.
11. Clean aerators.
12. Replace or tighten valve stem packing if required.

13. Replace valve seats, washers and cartridges if required.
14. Check and repair float valve if required.
15. Check and repair flapper valve if required
16. Check and repair diaphragm flush valve if required.
17. Repair drinking water fountain.
18. Repair or replace water heater. (See Skill 40)
19. Repair or replace disposal.
20. Turn water on.
21. Check for proper operation.
22. Clean tools.
23. Clean up work site.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Toilet and sink fixtures, faucets and valves are repaired.

PROCESS

All performance elements for repairing toilet and sink fixtures, faucets and valves are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Plumbing and valve supplies
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Remove drain clogs.

PERFORMANCE CRITERIA

Drain clogs are removed according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on type of repair needed.

PERFORMANCE ELEMENTS

1. Observe operation to identify problems.
2. Develop repair plan.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Select repair and replacement materials.
6. Set up safety barrier around work site.
7. Put on PPE.
8. Shut off water.
9. Thaw frozen pipes if required.
10. Use chemical drain cleaner if appropriate.
11. Use rubber force cup if required.
12. Remove trap and clean out if required.
13. Use closet auger if required.
14. Open cleanout plug if required.
15. Use drain auger if required.
16. Use a sewer rod if required.

17. Identify ways to prevent future problems.
18. Turn water on.
19. Check for proper operation.
20. Clean tools
21. Clean up work site.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Drain clogs are removed.

PROCESS

All performance elements for removing drain clogs are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

INSTALL NEW PIPING.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Piping schematic
- Plumbing and valve supplies
- Hot work permit
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Install new piping.

PERFORMANCE CRITERIA

New piping is installed according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size of piping and complexity of schematic.

PERFORMANCE ELEMENTS

1. Study project plan and piping schematics.
2. Develop project plan.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Identify proper piping material and sizes.
6. Calculate cut lengths for pipe.
7. Set up safety barrier around work site.
8. Shut off water.
9. Put on PPE.
10. Cut pipe to length.
11. Debur ends.
12. Prepare and install fittings, pipe and valves.
13. Ensure pipe is supported correctly.
14. Align fittings, pipes and valves; level and plumb.

15. Turn water on and flush piping system.
16. Check for leaks.
17. Tighten joints or rework if required.
18 Retest for leaks.
19. Check for proper operation.
20. Clean tools.
21. Clean up work site.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

New piping is installed.

PROCESS

All performance elements for installing new piping are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Work order(s)
Maintenance toolbox
Personal protective equipment (PPE)
Preventive/predictive maintenance procedures
Manufacturers' instructions
Fire sprinkler inspection report
National Fire Protection Association (NFPA) requirements
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Insurance requirements
Industry standards

WORK TO BE PERFORMED

Inspect fire sprinkler systems.

PERFORMANCE CRITERIA

Fire sprinkler systems are inspected according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size of fire sprinkler system and complexity of that system.

PERFORMANCE ELEMENTS

1. Identify inspection, testing and maintenance requirements.
2. Determine and obtain tools and equipment needed.
3. Put on PPE.
4. Verify water pressure.
5. Inspect for leaks.
6. Inspect for appropriate signage.
7. Inspect, test and maintain all system valves as required.
8. Inspect sprinkler heads.
9. Inspect fire pump operation if applicable.
10. Inspect standpipes if applicable.
11. Conduct water flow tests if applicable.
12. Identify and arrange for inspection of items which require certification.
13. Document inspection results and arrange for maintenance on deficiencies.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA, EPA and NFPA requirements are followed.

QS/ISO standards are followed.

Insurance requirements are followed.

Local, state and federal regulations are followed.

PRODUCT

Fire sprinkler systems are inspected.

PROCESS

All performance elements for inspecting fire sprinkler systems are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Wastewater and sewer discharge standards
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Monitor sewer systems.

PERFORMANCE CRITERIA

Sewer systems are monitored according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of sewer systems and complexity of those systems.

PERFORMANCE ELEMENTS

1. Identify inspection, testing and maintenance requirements.
2. Determine and obtain tools and equipment needed.
3. Put on PPE.
4. Inspect flow rates and discharge levels.
5. Inspect holding tanks.
6. Test system for odors.
7. Clean screens and separators.
8. Remove debris and clogs if required.
9. Inspect for leakage and spillage.
10. Inspect manhole accesses.
11. Inspect and maintain system valves.
12. Inspect lift stations.
13. Inspect and maintain aeration motors and pumps.

14. Inspect chlorination system.
15. Check effluent for conformance to wastewater standards.
16. Document inspection results and submit reports to appropriate party if required.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Sewer systems are monitored.

PROCESS

All performance elements for monitoring sewer systems are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

REPAIR GAS AND WATER LINES.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Plumbing and valve supplies
- Hot work permit
- Piping schematics
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Insurance requirements
- Industry standards

WORK TO BE PERFORMED

Repair gas and water lines.

PERFORMANCE CRITERIA

Gas and water lines are repaired according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and complexity of lines. It is critical that this skill be completed as quickly as possible.

PERFORMANCE ELEMENTS

1. Study piping schematics.
2. Develop project plan.
3. Inspect work area for potential safety hazards.
4. Put on PPE.
5. Determine and obtain tools and equipment needed.
6. Locate underground lines and other utilities and cables if required.
7. Set up safety barrier around work site.
8. Prepare facility for loss of supply and notify affected customers.
9. Apply lockout-tagout as required.
10. Excavate lines if required.
11. Locate damaged lines.

12. Repair damaged section of lines.
13. Retest for leaks.
14. Check lines for proper operation.
15. Clean up work site.
16. Remove lockout-tagout.
17. Restore service.
18. Comply with required inspections.
19. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Insurance requirements are followed.

Local, state and federal regulations are followed.

PRODUCT

Gas and water lines are repaired.

PROCESS

All performance elements for repairing gas and water lines are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Replacement water heater
- Work order(s)
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain water heater.

PERFORMANCE CRITERIA

Water heater is maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of water heater.

PERFORMANCE ELEMENTS

1. Review documentation and manuals.
2. Inspect work area for potential safety hazards.
3. Determine and obtain tools and equipment needed.
4. Put on PPE.
5. Identify any symptoms of potential malfunctions.
6. Analyze symptoms to determine possible causes.
7. Test pressure relief valve and replace if required.
8. Check flue for proper draft (gas).
9. Apply lockout and tagout equipment.
10. Inspect pilot assembly and burners and clean if required (gas).
11. Check heating element (electrical).
12. Check thermostat and replace if required.
13. Drain and flush tank.
14. Lubricate moving parts if required.

15. Replace water heater if required.
    a. Set up safety barrier around work site.
    b. Protect floors and surfaces.
    c. Remove guards if required
    d. Turn off gas or electricity to heater.
    e. Turn off water supply.
    f. Open hot water faucet drain tank.
    g. Remove piping and fittings.
    h. Remove old water heater and dispose of properly.
    i. Position new heater so piping and gas vent pipe will connect.
    j. Install heater's new draft hood (gas).
    k. Connect hot and cold water piping.
    l. Fill water heater and vent pressure relief valve.
    m. Connect electrical service if required.
    n. Connect gas service if required.
    o. Test for gas leaks if required.
    p. Clean up work site.
    q. Remove lockout and tagout.
    r. Test operation of water heater.
16. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Water heater is evaluated and replaced.

PROCESS

All performance elements for evaluating and replacing water heater are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Blueprints or sketches
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Sheet metal bending and cutting or welding tools
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Install/repair safety guards.

PERFORMANCE CRITERIA

Safety guards are installed/repaired according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of guards.

PERFORMANCE ELEMENTS

1. Review equipment blueprints and operating manuals.
2. Inspect work area for potential safety hazards.
3. Develop work plan.
4. Determine and obtain tools and equipment needed.
5. Set up safety barrier around work site.
6. Put on PPE.
7. Lock out and tag out equipment.
8. Lay out, measure and mark critical dimensions and details.
9. Remove existing guard.
10. Repair damaged guard if possible.
11. Fabricate or purchase new guard if required.
12. Try guard for fits and clearance.
13. Drill, bolt and secure guards to equipment.
14. Inspect guards for fits and clearance after tightening.
15. Clean up work site.

16. Remove lockout and tagout.
17. Restart equipment.
18. Lock out and tag out if additional work is required.
19. Retighten all bolts, screws and fasteners.
20. Document work performed.
21. Follow up and inspect as required.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Safety guards are installed/repaired.

PROCESS

All performance elements for installing/repairing safety guards are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance records
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Equipment blueprints
- Replacement belt and pulleys
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain drive belts and pulleys.

PERFORMANCE CRITERIA

Drive belts and pulleys are maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of belt drive.

PERFORMANCE ELEMENTS

1. Review equipment blueprints and operating manuals.
2. Inspect work area for potential safety hazards.
3. Develop work plan.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Set up safety barrier around work site.
7. Check running machine for signs of malfunctioning belts.
8. Shut down, lock out and tag out equipment.
9. Remove guards.
10. Determine proper belt deflection force required for tension.
11. Check pulley and belts for tension, wear and damage.
12. Loosen motor and relieve belt tension if required.
13. Clean or replace damaged components.

14. Identify and correct any causes for failure.
15. Mount new pulleys to shafts if required.
16. Install new belt, if required, but do not tighten.
17. Check and correct motor mounting for soft foot condition.
18. Check and correct motor mounting for levelness.
19. Check and correct motor mounting for vertical angular alignment.
20. Check and correct motor mounting for horizontal angular alignment.
21. Check and correct pulleys for groove alignment.
22. Torque motor mounting bolts to hold proper alignment.
23. Apply initial tension to the belt.
24. Clean up work site.
25. Remove lockout and tagout.
26. Run motor to briefly seat belt.
27. Reapply lockout and tagout.
28. Retighten belt to correct tension if required.
29. Install guards.
30. Remove lockout and tagout.
31. Restart equipment.
32. Document work performed.
33. Follow up, inspect and retighten belt to correct tension as required.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Drive belts and pulleys are maintained.

PROCESS

All performance elements for maintaining drive belts and pulleys are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Work order(s)
Maintenance toolbox
Preventive/predictive maintenance requirements
Maintenance records
Equipment blueprints
Replacement chain and sprocket
Lubrication supplies
Chain puller
Chain breaker
Personal protective equipment (PPE)
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Maintain roller chains and sprockets.

PERFORMANCE CRITERIA

Roller chains and sprockets are maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of chains and sprockets.

PERFORMANCE ELEMENTS

1. Review equipment blueprints and operating manuals.
2. Inspect work area for potential safety hazards.
3. Develop work plan.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Set up safety barrier around work site.
7. Check running machine for signs of malfunctioning chain.
8. Shut down, lock out and tag out equipment.
9. Remove guards.

10. Determine chain sag required for proper tension.
11. Clean and check chain and sprocket for tension, wear and damage.
12. Loosen motor and relieve chain tension if required.
13. Replace components as required.
14. Identify and correct any causes for failure.
15. Mount new sprockets to shafts if required.
16. Check and correct motor mounting for soft foot condition.
17. Check and correct motor mounting for levelness.
18. Check and correct motor mounting for vertical angular alignment.
19. Check and correct motor mounting for horizontal angular alignment.
20. Check and correct sprockets for face alignment.
21. Torque motor mounting bolts to hold proper alignment.
22. Mount new chain to sprockets if required.
23. Apply initial tension to chain by measuring chain sag.
24. Lubricate chain.
25. Clean up work site.
26. Remove lockout and tagout.
27. Run motor to briefly test chain.
28. Reapply lockout and tagout.
29. Retighten chain to correct tension if required.
30. Install guards.
31. Remove lockout and tagout.
32. Restart equipment.
33. Recheck chain sag after 24 hours of operation.
34. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Roller chains and sprockets are maintained.

PROCESS

All performance elements for maintaining roller chains and sprockets are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance records
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Equipment blueprints
- Replacement seals and bearings
- Bearing puller
- Alignment equipment
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain bearings.

PERFORMANCE CRITERIA

Bearings are maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of bearings.

PERFORMANCE ELEMENTS

1. Review equipment blueprints and operating manuals.
2. Develop work plan.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Set up safety barrier around work site.
7. Check running machine for signs (e.g., heat, noise, vibration, etc.) of malfunctioning bearings.
8. Shut down, lock out and tag out equipment.
9. Remove guards.
10. Check for and correct lubrication.
11. Check for and eliminate corrosion and dirt.

12. Check for and correct misalignment.
13. Check for and correct over loading.
14. Check for axial and radial clearance.
15. Remove and replace failed bearings.
16. Check shaft for damage.
17. Adjust bearing preloads if required.
18. Lubricate new bearings if required.
19. Remove and replace leaking seals if required.
20. Install guards.
21. Clean up work site.
22. Remove lockout and tagout.
23. Restart equipment.
24. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Bearings are maintained.

PROCESS

All performance elements for maintaining bearings are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance records
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Equipment blueprints
- Lubrication supplies
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Lubricate mechanisms.

PERFORMANCE CRITERIA

Mechanisms are lubricated according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of lubrication and mechanism.

PERFORMANCE ELEMENTS

1. Review equipment blueprints and operating manuals.
2. Inspect work area for potential safety hazards.
3. Determine type of lubrication requirements.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Check running machine for signs of malfunctioning bearings.
7. Shut down, lock out and tag out equipment if required.
8. Remove guards.
9. Determine locations requiring lubrication.
10. Check for and correct oil leakage.
11. Identify and correct for lubrication failures.
12. Determine proper type of lubricant for each location.
13. Determine amount of lubricant required for each location.

14. Check lubrication levels.
15. Check lubrication for contamination and loss of viscosity.
16. Change oil and filters if required.
17. Add additional lubrication if required.
18. Install guards.
19. Clean up work site.
20. Remove lockout and tagout.
21. Restart equipment.
22. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Mechanisms are lubricated.

PROCESS

All performance elements for lubricating mechanisms are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance records
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Lubrication supplies
- Air filter
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain air compressors

PERFORMANCE CRITERIA

Air compressors are maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of air compressors.

PERFORMANCE ELEMENTS

1. Review equipment operating manuals.
2. Determine number of running hours since last maintenance.
3. Determine level of maintenance required.
4. Inspect work area for potential safety hazards.
5. Determine and obtain tools and equipment needed.
6. Put on PPE.
7. Check running compressor for signs of malfunctioning.
8. Check and record motor amps and voltage.
9. Check operating temperatures.
10. Shut down, lock out and tag out compressor.
11. Remove guards if required.
12. Check for and correct oil leakage.

13. Check and correct lubrication levels.
14. Check lubrication for contamination and loss of viscosity.
15. Change oil and oil filters if required.
16. Check v-belt and replace or tighten if required.
17. Grease motors.
18. Check bolts for proper torque.
19. Inspect motor starter and contacts.
20. Inspect pressure switch.
21. Inspect check valve.
22. Drain receiver tanks.
23. Check and manually operate all safety valves.
24. Check and clean air coolers.
25. Inspect inlet air filter and replace if required.
26. Check air dryer for proper operation.
27. Install guards.
28. Clean up work site.
29. Remove lockout and tagout.
30. Restart equipment.
31. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Air compressors are maintained.

PROCESS

All performance elements for maintaining air compressors are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance records
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Replacement seals and packing
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain pumps.

PERFORMANCE CRITERIA

Pumps are maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of pump.

PERFORMANCE ELEMENTS

1. Review equipment operating manuals.
2. Determine number of running hours since last maintenance.
3. Determine level of maintenance required.
4. Inspect work area for potential safety hazards.
5. Determine and obtain tools and equipment needed.
6. Put on PPE.
7. Check running pumps for signs (e.g., flow issues, cavitation, noise, etc.) of malfunctioning.
8. Check motor for proper amperage, voltage and operating temperatures.
9. Check mechanical seals or stuffing box and packing for proper adjustment.
10. Check discharge for proper pressure and flow.
11. Check suction line for leaks and hose blockage and prime.
12. Inspect foot valve if required.
13. Shut down, lock out and tag out pump if required.
14. Check bearings for proper lubrication.

15. Check and clean suction strainer.
16. Remove guards.
17. Check impeller for clearance and wear and replace if required.
18. Check seals and packing for proper operation and replace if required.
19. Check bearings and replace, if required.
20. Check bolts for proper torque.
21. Inspect motor starter and contacts.
22. Install guards.
23. Clean up work site.
24. Remove lockout and tagout.
25. Restart equipment and check performance.
26. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Pumps are maintained.

PROCESS

All performance elements for maintaining pumps are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

MAINTAIN COUPLING ALIGNMENT.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance records
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Equipment blueprints
- Alignment equipment
- Replacement couplings
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain coupling alignment.

PERFORMANCE CRITERIA

Coupling alignment is maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of coupling.

PERFORMANCE ELEMENTS

1. Review equipment blueprints and operating manuals.
2. Inspect work area for potential safety hazards.
3. Develop work plan.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Set up safety barrier around work site.
7. Check running machine for signs of malfunctioning coupling.
8. Shut down, lock out and tag out equipment.
9. Remove guards.
10. Mount new coupling on shaft if required.
11. Check and correct motor mounting for soft foot condition.
12. Check and correct motor mounting for levelness.

13. Check and correct motor mounting for vertical angular alignment.
14. Check and correct motor mounting for vertical parallel alignment.
15. Check and correct motor mounting for horizontal angular alignment.
16. Check and correct motor mounting for horizontal parallel alignment.
17. Check and correct coupling gap.
18. Lubricate coupling if required.
19. Torque motor mounting bolts to hold proper alignment.
20. Remove lockout and tagout.
21. Run motor to bring system up to operating temperature.
22. Reapply lockout and tagout.
23. Recheck alignments.
24. Install guards.
25. Clean up work site.
26. Remove lockout and tagout.
27. Restart equipment.
28. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Coupling alignment is maintained.

PROCESS

All performance elements for maintaining coupling alignment are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

MAINTAIN COMPRESSED GAS CYLINDER SYSTEM.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Compressed gas cylinders
- Replacement parts
- Leak detective device
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain compressed gas cylinder system.

PERFORMANCE CRITERIA

Compressed gas cylinder system is maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of compressed gas cylinder system.

PERFORMANCE ELEMENTS

1. Review equipment operating manuals.
2. Determine level of maintenance required.
3. Inspect work area for potential safety hazards.
4. Determine and obtain the tools and equipment needed.
5. Put on PPE.
6. Check system and cylinder pressures.
7. Check compressed gas system for signs of malfunction.
8. Check lines and connections for leakage; repair or replace as required.
9. Close cylinder valves and remove pressure from hose lines.
10. Shut down, lock out and tag out system.
11. Remove empty gas cylinders.
12. Inspect pressure regulators, inline filters and hoses.

13. Clean regulator inlet screens and seat.
14. Crack new cylinder valve to blow off dust.
15. Install regulator to new cylinder.
16. Reconnect hoses.
17. Open tank valves to desired pressures.
18. Check for leaks.
19. Install guards.
20. Clean up work site.
21. Remove lockout and tagout.
22. Restart equipment.
23. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Compressed gas cylinder system is maintained.

PROCESS

All performance elements for maintaining compressed gas cylinder system are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Replacement pneumatic components
- Personal protective equipment (PPE)
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain pneumatic systems.

PERFORMANCE CRITERIA

Pneumatic systems are maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of pneumatic system.

PERFORMANCE ELEMENTS

1. Review equipment operating manuals.
2. Determine level of maintenance required.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Check system air pressures and flow rates.
7. Apply lockout and tagout.
8. Drain receiver tanks.
9. Check and manually operate all safety valves.
10. Check air dryer for proper operation.
11. Drain and blow out mains and header pipes.
12. Check and repair lines for air leaks.
13. Inspect pressure regulators and in-line filters and replace if required.
14. Inspect and fill air lubricators.

15. Check operation of control valves and cylinders and replace if required.
16. Install guards.
17. Clean up work site.
18. Remove lockout and tagout.
19. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Pneumatic systems are maintained.

PROCESS

All performance elements for maintaining pneumatic systems are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Preventive/predictive maintenance requirements
- Replacement hydraulic components
- Personal protective equipment (PPE)
- Manufacturers' instructions
- Environmental Protection Agency (EPA) requirements
- QS/ISO standards
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain hydraulic systems.

PERFORMANCE CRITERIA

Hydraulic systems are maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of hydraulic system.

PERFORMANCE ELEMENTS

1. Review equipment operating manuals.
2. Determine level of maintenance required.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Check hydraulic power unit for proper performance.
7. Check and repair system leaks.
8. Check pump pressure and flow rate.
9. Adjust relief, unloading, and pressure control valves for proper pressure.
10. Adjust flow controls for proper speeds.
11. Shut down, lock out and tag out equipment.
12. Remove guards.
13. Clean inlet strainer and filters if required.
14. Test hydraulic fluids for contamination and viscosity.

15. Drain hydraulic fluids if required.
16. Fill reservoir with hydraulic fluid.
17. Replace pump or motor if required.
18. Inspect and replace seals and gaskets if required.
19. Inspect and replace hoses, tubing and fittings if required.
20. Check operation of control valves and cylinders and replace if required.
21. Install guards.
22. Clean up work site.
23. Remove lockout and tagout.
24. Restart equipment.
25. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Hydraulic systems are maintained.

PROCESS

All performance elements for maintaining hydraulic systems are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Work order(s)
Maintenance toolbox
Preventive/predictive maintenance requirements
Personal protective equipment (PPE)
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Maintain backup power generator.

PERFORMANCE CRITERIA

Backup power generator is maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of backup power generator.

PERFORMANCE ELEMENTS

1. Review equipment operating manuals.
2. Determine level of maintenance required.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Check backup fuel supply.
7. Check battery for voltage and fluid level.
8. Check engine for full load quick start.
9. Conduct routine load test for generator.
10. Check generator output for voltage and current.
11. Check operating engine for proper temperature, speed and performance.
12. Apply lockout and tagout.
13. Check oil levels and change engine oil if required.
14. Check automatic power transfer switching system.
15. Place backup generator system in standby-ready mode.

16. Clean up work site.
17. Remove lockout and tagout.
18. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Backup power generator is maintained.

PROCESS

All performance elements for maintaining backup power generator are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Replacement lighting parts
- Lighting circuit schematics
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- National Electric Code (NEC)
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Repair or replace lighting and fixtures.

PERFORMANCE CRITERIA

Lighting and fixtures are repaired or replaced according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and number of lights and fixtures.

PERFORMANCE ELEMENTS

1. Review documentation and operating manuals.
2. Review circuit schematics.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Set up safety barrier around work site.
7. Check for specified lighting quality.
8. Check for faulty lighting components.
9. Determine cause of fault.
10. Check lighting relays, contactors, sensors, timers, switches and circuit breakers.
11. Evaluate and replace lighting element if required.
12. Determine lamp wattage, lumens, size and type required for application.

13. Shut down, lock out and tag out equipment if required.
14. Evaluate and replace ballast/starter if required.
15. Evaluate and replace lamp holder if required.
16. Evaluate and clean or replace lighting diffuser or lens.
17. Evaluate and clean or replace reflector.
18. Inspect and repair emergency lighting system.
19. Test batteries and repair charging system if required.
20. Inspect and repair exit lighting system.
21. Evaluate and repair specialty lighting in hazardous areas.
22. Clean up work site.
23. Remove lockout and tagout if required.
24. Restart and test operation of equipment.
25. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All electrical work meets NEC requirements.

Local, state and federal regulations are followed.

PRODUCT

Lighting and fixtures are repaired or replaced.

PROCESS

All performance elements for repairing or replacing lighting and fixtures are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

TROUBLESHOOT AND REPAIR FAULTY ELECTRICAL CIRCUITS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Electrical circuit schematics
- Replacement electrical components
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- National Electric Code (NEC)
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Troubleshoot and repair faulty electrical circuits.

PERFORMANCE CRITERIA

Faulty electrical circuits are troubleshot and repaired according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of electrical circuit.

PERFORMANCE ELEMENTS

1. Review documentation and operating manuals.
2. Review circuit schematics.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Set up safety barrier around work site.
7. Identify symptoms.
8. Measure current draw.
9. Analyze symptoms to determine possible causes.
10. Remove guards if required.
11. Test circuit for specified readings to isolate possible causes of fault.
12. Utilize electrical tests logically in process of elimination.

13. Replace blown fuse or tripped circuit breaker, if required.
14. Test for voltage, resistance, open circuits and shorted elements if required.
15. Shut down, lock out and tag out circuit.
16. Remove suspect part for bench testing if required.
17. Identify specific cause of the fault.
18. Adjust, repair or replace defective components.
19. Reinstall components into circuit.
20. Test circuit for proper operation.
21. Install guards.
22. Clean up work site.
23. Remove lockout and tagout.
24. Restart and test operation of equipment.
25. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All electrical work meets NEC requirements.

Local, state and federal regulations are followed.

PRODUCT

Faulty electrical circuits are troubleshot and repaired.

PROCESS

All performance elements for troubleshooting and repairing faulty electrical circuits are critical. Performance elements are numbered to show appropriate sequence for con.pleting the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Electrical circuit schematics
- Conduit and wiring supplies
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- National Electric Code (NEC)
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Install conduit and wiring.

PERFORMANCE CRITERIA

Conduit and wiring are installed according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and quantity of conduit and wiring.

PERFORMANCE ELEMENTS

1. Review documentation and operating manuals.
2. Review circuit schematics.
3. Inspect work area for potential safety hazards.
4. Determine installation environment.
5. Determine wire size, type and quantity.
6. Determine conduit size and type.
7. Determine type of fittings and hardware required.
8. Determine and obtain tools and equipment needed.
9. Put on PPE.
10. Set up safety barrier around work site.
11. Shut down, lock out and tag out circuit.
12. Cut and thread conduit to proper length if required.
13. Determine bend radius and location and bend conduit if required.

14. Attach and assemble conduit into place.
15. Label and assemble wire bundle.
16. Pull wire bundle through conduit.
17. Connect wires to termination points.
18. Install guards if required.
19. Clean up work site.
20. Remove lockout and tagout.
21. Restart and test operation of equipment.
22. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All electrical work meets NEC requirements.

Local, state and federal regulations are followed.

PRODUCT

Conduit and wiring are installed.

PROCESS

All performance elements for installing conduit and wiring are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

INSTALL ELECTRICAL FIXTURES, SWITCHES AND OUTLETS.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Electrical circuit schematics
- Replacement electrical components
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- National Electric Code (NEC)
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Install electrical fixtures, switches and outlets.

PERFORMANCE CRITERIA

Electrical fixtures, switches and outlets are installed according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and quantity of fixtures, switches and outlets installed.

PERFORMANCE ELEMENTS

1. Review documentation and manuals.
2. Review circuit schematics.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Shut down, lock out and tag out equipment.
7. Set up safety barrier around work site.
8. Remove guards and covers.
9. Rough in new components (e.g., wiring boxes, conduit, etc.) if required.
10. Drill and cut out building members to allow passage of wire.
11. Pull wire between boxes if required.
12. Strip wires and attach to fixture, switch or outlet.
13. Install guards and covers.

14. Clean up work site.
15. Remove lockout and tagout.
16. Check wires for voltage and polarity.
17. Test operation of equipment.
18. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All electrical work meets NEC requirements.

Local, state and federal regulations are followed.

PRODUCT

Electrical fixtures, switches and outlets are installed.

PROCESS

All performance elements for installing electrical fixtures, switches and outlets are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Electrical circuit schematics
- Replacement electrical components
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- National Electric Code (NEC)
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain motors and motor starters.

PERFORMANCE CRITERIA

Motors and motor starters are maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and quantity of motors and motor starters.

PERFORMANCE ELEMENTS

1. Review documentation and operating manuals.
2. Review circuit schematics.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Set up safety barrier around work site.
7. Check motor frame and bearings for excessive heat or vibration.
8. Use vibration analyzer and compare readings to base data.
9. Check for hot or loose connections.
10. Listen for abnormal noise.
11. Analyze any symptoms to determine possible causes.
12. Shut down, lock out and tag out equipment.
13. Remove guards if required.

14. Remove dirt and corrosion.
15. Lubricate bearings if required.
16. Check motor insulation with an insulation resistance test if required.
17. Check brushes and commutators if required.
18. Inspect starter contacts and check overload protection.
19. Install guards if required.
20. Clean up work site.
21. Remove lockout and tagout.
22. Restart and test equipment operation.
23. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All electrical work meets NEC requirements.

Local, state and federal regulations are followed.

PRODUCT

Motors and motor starters are maintained.

PROCESS

All performance elements for maintaining motors and motor starters are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Electrical circuit schematics
- Replacement parts
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- National Electric Code (NEC)
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Install and repair basic electrical appliances.

PERFORMANCE CRITERIA

Basic electrical appliances are installed and repaired according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of electrical appliance.

PERFORMANCE ELEMENTS

1. Review documentation and manuals.
2. Review electrical circuit schematics.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Identify symptoms.
7. Analyze symptoms to determine possible causes.
8. Check for user and programming errors.
9. Replace blown fuse or tripped circuit breaker if required.
10. Test circuit for specified reading to isolate possible causes of fault.
11. Test for electrical shorts and ground faults.
12. Check for gas pressure if required.

13. Shut down, lock out and tag out equipment if required.
14. Set up safety barrier around work site.
15. Protect floors and surfaces.
16. Remove guards or covers if required.
17. Adjust, repair or replace components for proper operation.
18. Identify and correct specific cause of fault.
19. Remove old appliance, if required, and dispose of properly.
20. Move and anchor new appliance into position.
21. Connect electrical service.
22. Connect gas service if required and test for leaks.
23. Install guards and covers if required.
24. Clean up work site.
25. Remove lockout and tagout.
26. Test operation of equipment.
27. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All electrical work meets NEC requirements.

Local, state and federal regulations are followed.

PRODUCT

Basic electrical appliances are installed and repaired.

PROCESS

All performance elements for installing and repairing basic electrical appliances are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

MAINTAIN FIRE ALARM SYSTEM.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Fire alarm circuit schematics
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- Insurance requirements
- National Electric Code (NEC)
- National Fire Protection Association (NFPA) requirements
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain fire alarm system.

PERFORMANCE CRITERIA

Fire alarm system is maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of fire alarm system.

PERFORMANCE ELEMENTS

1. Review documentation and operating manuals.
2. Review circuit schematics.
3. Notify monitoring agency as required.
4. Notify risk management agencies during impairment if required.
5. Inspect work area for potential safety hazards.
6. Determine and obtain tools and equipment needed.
7. Put on PPE.
8. Set up safety barrier around work site.
9. Shut down lockout and tagout equipment if required.
10. Remove guards or covers if required.
11. Test smoke alarms.
12. Change smoke alarm batteries.

13. Check voltages.
14. Check control center.
15. Check fire alarm pull stations.
16. Check heat or ionization sensors.
17. Check enunciators.
18. Check electric and mechanical fire safety and fire locking systems.
19. Respond to system failures.
20. Verify proper operation of all audible alarms.
21. Test circuit for proper operation.
22. Install guards or covers if required.
23. Clean up work site.
24. Remove lockout and tagout.
25. Restart and test equipment for proper operation.
26. Document work performed.
27. Notify appropriate agencies that system is back in operation.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All electrical work meets NEC requirements.

Insurance requirements are followed.

Local, state and federal regulations are followed.

PRODUCT

Fire alarm system is maintained.

PROCESS

All performance elements for maintaining fire alarm system are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Replacement parts
- Security circuit schematics
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- Insurance requirements
- National Electric Code (NEC)
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain security alarm systems.

PERFORMANCE CRITERIA

Security alarm systems are maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of security alarm system.

PERFORMANCE ELEMENTS

1. Review documentation and operating manuals.
2. Review circuit schematics.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Set up safety barrier around work site.
7. Check for proper system operation.
8. Program equipment to provide specific features.
9. Check connection to outside service if required.
10. Test system alarms.
11. Reset and correct cause of false alarms.
12. Check detection devices.

13. Check cameras, monitors and control equipment.
14. Check security doors, locks and locking systems controls.
15. Check wiring and connectors.
16. Apply lockout and tagout equipment if required.
17. Replace faulty components.
18. Clean up work site.
19. Remove lockout and tagout if required.
20. Restart and test equipment for proper operation.
21. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All electrical work meets NEC requirements.

Insurance requirements are followed.

Local, state and federal regulations are followed.

PRODUCT

Security alarm systems are maintained.

PROCESS

All performance elements for maintaining security alarm systems are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Replacement telephone parts
- Phone circuit schematics
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- National Electric Code (NEC)
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain telephone system.

PERFORMANCE CRITERIA

Telephone system is maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of the telephone system.

PERFORMANCE ELEMENTS

1. Review documentation and operating manuals.
2. Review circuit schematics.
3. Inspect work area for potential safety hazards.
4. Determine and obtain tools and equipment needed.
5. Put on PPE.
6. Put up safety barrier around work site.
7. Check for specified telephone quality.
8. Program equipment to provide specific features.
9. Test for dial tone.
10. Check for faulty telephone components.
11. Check telephone connection to inside or outside service lines.
12. Determine cause of fault.
13. Check and replace phone or handset, if required.

14. Shut down, lock out and tag out equipment if required.
15. Check and replace power supplies, switches, switchboards and printed circuit boards if required.
16. Repair damaged phone lines, connectors and cables.
17. Test to verify that equipment functions properly.
18. Clean up work site.
19. Remove lockout and tagout if required.
20. Restart and test equipment for proper operation.
21. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

All electrical work meets NEC requirements.

Local, state and federal regulations are followed.

PRODUCT

Telephone system is maintained.

PROCESS

All performance elements for maintaining telephone system are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Monitor energy management systems.

PERFORMANCE CRITERIA

Energy management systems are monitored according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of energy management systems.

PERFORMANCE ELEMENTS

1. Review documentation and operating manuals.
2. Check system for proper function.
3. Program equipment to optimize energy consumption.
4. Check automatic temperature setback functions.
5. Check automatic lighting setback functions.
6. Test inputs for accuracy and calibrate if required.
7. Test outputs for accuracy and calibrate if required.
8. Check remote equipment controls for functions.
9. Check overall facility areas to confirm proper operation.
10. Test to verify that equipment functions properly.
11. Check data acquisition and storage functions.
12. Check overall consumption rates and compare to desired targets.
13. Respond to system alerts.
14. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Energy management systems are monitored.

PROCESS

All performance elements for monitoring energy management systems are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain air conditioning system.

PERFORMANCE CRITERIA

Air conditioning system is maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of air conditioning system.

PERFORMANCE ELEMENTS

Note: Individuals must have proper certification to work on refrigerant systems.

1. Review documentation and manuals.
2. Inspect work area for potential safety hazards.
3. Determine and obtain tools and equipment needed.
4. Put on PPE.
5. Identify any symptoms of potential malfunctions.
6. Analyze symptoms to determine possible causes.
7. Check for user and programming errors.
8. Check performance on all major components.
9. Check pressures and temperatures.
10. Test for proper amperages and voltages.
11. Apply lockout and tagout equipment.
12. Clean or replace air filters.
13. Clean heat exchanger coils.

14. Lubricate moving parts, as required.
15. Inspect for oil and refrigerant leaks.
16. Check operating and safety controls.
17. Inspect system pumps.
18. Inspect cooling tower.
19. Inspect condensers.
20. Inspect evaporators.
21. Inspect and test motor.
22. Check belts and drives.
23. Check temperature controls.
24. Tighten electrical connections to equipment.
25. Inspect fans, motors and starters.
26. Clean up work site.
27. Remove lockout and tagouts if required.
28. Test operation of equipment.
29. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Air conditioning system is maintained.

PROCESS

All performance elements for maintaining air conditioning system are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Evaluate control circuit fuse for proper operation and replace, if necessary.

PERFORMANCE CRITERIA

Control circuit fuse is evaluated and replaced according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to replace fuse is 15 minutes. Troubleshooting time will vary.

PERFORMANCE ELEMENTS

1. Follow industry standards and procedures for checking electrical components.
2. Determine and obtain tools and equipment needed.
3. Put on PPE.
4. Check fuse for continuity (resistance).
5. Troubleshoot cause of fuse failure.
6. Replace fuse if defective.
7. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Control circuit fuse is evaluated and replaced if necessary.

PROCESS

All performance elements for evaluating and replacing control circuit fuse are critical and must be performed in sequence.

EVALUATE THERMOSTAT TEMPERATURE CONTROL AND OPERATION.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Replacement thermostat temperature control of proper type and range
Work order(s)
Maintenance toolbox
Personal protective equipment (PPE)
Preventive/predictive maintenance procedures
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Evaluate thermostat temperature control and operation.

PERFORMANCE CRITERIA

Thermostat temperature control and operation is evaluated according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill is one hour.

PERFORMANCE ELEMENTS

1. Follow industry standards and procedures for checking electrical components.
2. Determine and obtain tools and equipment needed.
3. Determine desired operating mode.
4. Determine temperature at thermostat sensing bulb.
5. Adjust thermostat to call for system operation.
6. Determine if system energizes.
7. Determine if proper voltage is applied to thermostat.
8. Check voltage across switch terminals and compare to normal operating conditions.
9. Replace thermostat if defective.
10. Test replacement thermostat for proper operation.
11. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Thermostat temperature control and operation is evaluated.

PROCESS -

All performance elements for evaluating thermostat temperature control and operation are critical and must be performed in sequence.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Work order(s)
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Test for and repair refrigerant leaks.

PERFORMANCE CRITERIA

Refrigerant leaks are tested for and repaired according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of refrigerant leaks.

PERFORMANCE ELEMENTS

Note: Individuals must have proper certification to work on refrigerant systems.

1. Review documentation and manuals.
2. Inspect work area for potential safety hazards.
3. Determine and obtain tools and equipment needed.
4. Put on PPE.
5. Identify any symptoms of potential malfunctions.
6. Analyze symptoms to determine possible causes.
7. Check for correct amount of refrigerant.
8. Test for refrigerant leaks using a leak detector.
9. Apply lockout and tagout equipment.
10. Recover any refrigerant that must be evacuated from the system.
11. Fix any leaks and pressure test.
12. Evacuate system.
13. Charge system with correct amount of refrigerant.

14. Retest system for leaks.
15. Clean up work site.
16. Remove lockout and tagout if required.
17. Test operation of equipment.
18. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Refrigerant leaks are tested for and repaired.

PROCESS

All performance elements for testing and repairing refrigerant leaks are critical and must be performed in sequence.

REPLACE CONDENSER FAN BLADE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Unit with defective fan blade
Replacement fan blade with proper shaft size, diameter, pitch and correct rotation
Work order(s)
Maintenance toolbox
Personal protective equipment (PPE)
Preventive/predictive maintenance procedures
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Replace condenser fan blade.

PERFORMANCE CRITERIA

Condenser fan blade is replaced according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill is one hour.

PERFORMANCE ELEMENTS

1. Follow industry standards and procedures.
2. Determine and obtain tools and equipment needed.
3. Apply lockout and tagout equipment.
4. Remove defective fan blade using proper tools.
5. Replace fan blade.
6. Clean up work site.
7. Remove lockout and tagout.
8. Test for proper operation of replacement fan blade.
9. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Condenser fan blade is replaced.

PROCESS

All performance elements for replacing condenser fan blade are critical and must be performed in sequence.

EVALUATE THERMOCOUPLE AND REPLACE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Replacement thermocouple of proper type
- Work order(s)
- Maintenance toolbox
- Thermocouple test adapter
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Evaluate thermocouple for proper operation and replace, if necessary.

PERFORMANCE CRITERIA

Thermocouple is evaluated and replaced according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill is 45 minutes.

PERFORMANCE ELEMENTS

1. Follow industry standards and procedures for checking electrical components.
2. Determine and obtain tools and equipment needed.
3. Assure proper pilot flame at thermocouple location.
4. Check open circuit voltage of thermocouple.
   a. If open circuit voltage is within manufacturer's specifications, thermocouple is good.
   b. If open circuit voltage is not within manufacturer's specifications, thermocouple is defective and must be replaced; proceed to step 5.
5. Replace thermocouple with one of proper type.
6. Test replacement thermocouple for proper operation.
7. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Thermocouple is evaluated and replaced if necessary.

PROCESS

All performance elements for evaluating and replacing thermocouple are critical and must be performed in sequence.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Replacement spark ignitor of proper style and type
Work order(s)
Maintenance toolbox
Personal protective equipment (PPE)
Preventive/predictive maintenance procedures
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Evaluate spark ignitor for proper operation and replace, if necessary.

PERFORMANCE CRITERIA

Spark ignitor is evaluated and replaced according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to evaluate and replace spark ignitor is 45 minutes. Troubleshooting time will vary.

PERFORMANCE ELEMENTS

1. Follow industry standards and procedures for checking electrical components.
2. Determine and obtain tools and equipment needed.
3. Observe ignitor during trail for ignition.
   a. If ignitor sparks, ignitor is functioning properly.
   b. If ignitor fails to spark, proceed to step 4.
4. Examine ignitor for dust, dirt or cracks; clean ignitor and adjust spark gap before proceeding.
5. Check for proper voltage at ignitor leads.
   a. If proper voltage is present, ignitor is defective and must be replaced; proceed to step
   b. If proper voltage is not present, troubleshoot for failure in ignition module.
6. Replace ignitor with proper type of ignitor.
7. Test replacement ignitor for proper operation.
8. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Spark ignitor is evaluated and replaced if necessary.

PROCESS

All performance elements for evaluating and replacing spark ignitor are critical and must be performed in sequence.

EVALUATE HOT SURFACE IGNITOR AND REPLACE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Replacement hot surface ignitor of proper style and type
Work order(s)
Maintenance toolbox
Personal protective equipment (PPE)
Preventive/predictive maintenance procedures
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Evaluate hot surface ignitor for proper operation and replace, if necessary.

PERFORMANCE CRITERIA

Hot surface ignitor is evaluated and replaced according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to evaluate and replace hot surface ignitor is 45 minutes. Troubleshooting time will vary.

PERFORMANCE ELEMENTS

1. Follow industry standards and procedures for checking electrical components.
2. Determine and obtain tools and equipment needed.
3. Observe ignitor during trial for ignition.
   a. If ignitor glows, ignitor is good.
   b If ignitor does not glow, proceed to step 4.
4. Examine ignitor for dust, dirt or cracks and proper position.
5. Check for proper voltage at ignitor leads.
   a. If proper voltage is present, ignitor is defective and must be replaced; proceed to step 6.
   b. If proper voltage is not present, troubleshoot for failure in ignition module.
6. Replace ignitor.
7. Test for proper operation.
8. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Hot surface ignitor is evaluated and replaced if necessary.

PROCESS

All performance elements for evaluating and replacing hot surface ignitor are critical and must be performed in sequence.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Replacement gas valve of proper type
Work order(s)
Maintenance toolbox
Personal protective equipment (PPE)
Preventive/predictive maintenance procedures
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Evaluate gas valve (thermocouple type, MV type or electric-ignition type) for proper operation and replace, if necessary.

PERFORMANCE CRITERIA

Gas valve is evaluated and replaced according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to evaluate and replace gas valve is one hour. Troubleshooting time will vary.

PERFORMANCE ELEMENTS

Note: Evaluate thermocouple or MV generator before performing this skill, if applicable.

1. Follow industry standards and procedures for checking electrical components.
2. Determine and obtain tools and equipment needed.
3. Put on PPE.
4. Ensure that gas valve control knob is in proper position and thermostat is calling for heat.
5. Identify type of gas valve.
   a. If thermocouple-type valve is present, proceed to step 6.
   b. If MV-type or electric ignition-type valve is present, proceed to step 7.
6. Check continuity (resistance) of safety coil.
   a. If continuity of safety coil is functioning properly, proceed to step 7.
   b. If continuity of safety coil indicates open or short, proceed to step 10.

7. Check continuity (resistance) of main gas valve coil(s).
   a. If continuity of main gas valve coil(s) is good, proceed to step 8.
   b. If continuity of main gas valve coil(s) indicates open or short, proceed to step 10.
8. Determine proper voltage to main gas valve coil terminal(s).
   a. If proper voltage is present at main gas valve coil terminal(s) and valve fails to open, proceed to step 10.
   b. If no voltage or improper voltage is present at main gas valve coil terminal(s), problem is elsewhere and further troubleshooting is required.
9. Verify gas inlet and outlet pressure.
   a. If pressures are correct, valve is functioning properly.
   b. If outlet pressure is incorrect, do the following:
      1. Try to adjust to manufacturer's specifications.
      2. If not adjustable, proceed to step 10.
10. Apply lockout and tagout equipment.
11. Replace gas valve.
12. Clean up work site.
13. Remove lockout and tagout.
14. Test replacement gas valve for leaks and proper operation.
15. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Gas valve is evaluated and replaced if necessary.

PROCESS

All performance elements for evaluating and replacing gas valve are critical and must be performed in sequence.

INSPECT BELT DRIVE BLOWER SHAFT, BEARINGS AND PULLEYS AND LUBRICATE OR REPLACE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Replacement belt drive blower shaft, bearings and pulleys of proper style, type and size
- Work order(s)
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Inspect belt drive blower shaft, bearings and pulleys for proper operation and lubricate or replace, if necessary.

PERFORMANCE CRITERIA

Belt drive blower shaft, bearings and pulleys are inspected and lubricated or replaced according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of equipment.

PERFORMANCE ELEMENTS

1. Follow industry standards and procedures for checking mechanical components.
2. Determine and obtain tools and equipment needed.
3. Put on PPE.
4. Apply lockout and tagout equipment.
5. Remove guards.
6. Remove drive belt and determine that blower turns freely.

7. Inspect blower shaft, bearings and pulleys for any looseness/wear or excessive end play.
   a. If blower shaft has no looseness/wear in bearings or excessive end play, lubricate bearings.
   b. If blower shaft has any looseness/wear in bearings or excessive end play, proceed to step 8.
8. Replace blower shaft and/or bearings.
9. Inspect pulleys (sheaves) and belts for wear; replace or reinstall.
10. Lubricate bearings if required.
11. Install guards.
12. Clean up work site.
13. Remove lockout and tagout.
14. Test for proper operation.
15. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Belt drive blower shaft, bearings and pulleys are inspected and lubricated or replaced if necessary.

PROCESS

All performance elements for inspecting and lubricating or replacing belt drive blower shaft, bearings and pulleys are critical and must be performed in sequence.

INSPECT PRIMARY HEAT EXCHANGER AND CLEAN OR REPLACE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Replacement primary heat exchanger of proper type and size
Work order(s)
Maintenance toolbox
Personal protective equipment (PPE)
Preventive/predictive maintenance procedures
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Inspect primary heat exchanger for proper operation and clean or replace, if necessary.

PERFORMANCE CRITERIA

Primary heat exchanger is inspected and cleaned or replaced according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to inspect primary heat exchanger is two hours. Time required to inspect and replace primary heat exchanger is six hours.

PERFORMANCE ELEMENTS

Note: Vent pressure switch has been evaluated and replaced.

1. Follow industry standards and procedures for checking mechanical components.
2. Determine and obtain tools and equipment needed.
3. Put on PPE.
4. Apply lockout and tagout equipment.
5. Inspect primary heat exchanger for dirt and/or soot.
   a. If no dirt or soot is visible in heat exchanger, proceed to step 6.
   b. If dirt or soot is visible in heat exchanger, follow manufacturer's specifications for cleaning and proceed to step 6.

6. Test heat exchanger for leaks using proper test equipment/kit and according to manufacturer's specifications.
   a. If heat exchanger passes test, it is good.
   b. If heat exchanger fails test, it is defective and must be replaced; proceed to step 7.
7. Replace primary heat exchanger or furnace if required.
8. Clean up work site.
9. Remove lockout and tagout.
10. Test replacement components for proper operation.
11. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Primary heat exchanger is inspected and cleaned or replaced if necessary.

PROCESS

All performance elements for inspecting and cleaning or replacing primary heat exchanger are critical and must be performed in sequence.

INSPECT MAIN BURNER AND ORIFICE AND CLEAN OR REPLACE.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

Replacement main burner and orifice of proper style, type and size
Work order(s)
Maintenance toolbox
Personal protective equipment (PPE)
Preventive/predictive maintenance procedures
Manufacturers' instructions
QS/ISO standards
Environmental Protection Agency (EPA) requirements
Occupational Safety and Health Administration (OSHA) requirements
Local, state and federal standards/regulations
Company policy and procedures
Industry standards

WORK TO BE PERFORMED

Inspect main burner and orifice for proper operation and clean or replace, if necessary.

PERFORMANCE CRITERIA

Main burner and orifice are inspected and cleaned or replaced according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill is one hour.

PERFORMANCE ELEMENTS

1. Follow industry standards and procedures for checking mechanical components.
2. Determine and obtain tools and equipment needed.
3. Put on PPE.
4. Apply lockout and tagout equipment.
5. Remove main burner assembly and orifice.
6. Inspect main burner and orifice for metal deterioration, dirt, dust and carbon (soot) build up.
7. If metal deterioration is present, replace burner/orifice.
8. Ensure that orifice is open by running correct size orifice drill through orifice hole. Use caution so that orifice hole is not damaged. Blow out orifice by blowing through orifice in reverse direction of gas flow.

9. Determine that burner holes or ribbon slots are open; this may require drilling or brushing any hardened particles from openings. Blow any foreign particles from main burner assembly using a compressed gas that is environmentally safe.
10. Reinstall main burner orifices and burners.
11. Clean up work site.
12. Remove lockout and tagout.
13. Test main burner assembly for proper operation.
14. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Main burner and orifice are inspected and cleaned or replaced if necessary.

PROCESS

All performance elements for inspecting and cleaning or replacing main burner and orifice are critical and must be performed in sequence.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Boiler
- Work order(s)
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Operate and maintain boiler.

PERFORMANCE CRITERIA

Boiler is operated and maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of boiler.

PERFORMANCE ELEMENTS

1. Review documentation and manuals.
2. Inspect work area for potential safety hazards.
3. Determine and obtain tools and equipment needed.
4. Put on PPE.
5. Start up boiler system as required.
6. Monitor water level in boiler.
7. Monitor water treatment program if required.
8. Monitor steam pressure.
9. Monitor feed water pump.
10. Monitor and adjust burner flame if required.
11. Monitor fuel consumption and fuel supply.
12. Check operating and safety controls.
13. Check and adjust boiler pressure switches and controls.
14. Apply lockout and tagout equipment.
15. Clean and adjust burners.

16. Check electrical connections.
17. Check flue for proper draft if required.
18. Shut down boiler system as required.
19. Clean up work site.
20. Remove lockout and tagout.
21. Restart boiler and test for proper operation.
22. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Boiler is operated and maintained.

PROCESS

All performance elements for operating and maintaining the boiler are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

MONITOR STEAM SYSTEM OPERATION.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Steam system
- Work order(s)
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Monitor steam system operation.

PERFORMANCE CRITERIA

Steam system operation is monitored according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of steam system.

PERFORMANCE ELEMENTS

1. Review documentation and manuals.
2. Inspect work area for potential safety hazards.
3. Determine and obtain tools and equipment needed.
4. Put on PPE.
5. Identify any symptoms of potential malfunctions.
6. Analyze symptoms to determine possible causes.
7. Shut down, lock out and tag out equipment if required.
8. Monitor condensate return system and steam traps.
9. Check zone valves and thermostats.
10. Check for steam leaks.
11. Inspect expansion tanks.
12. Check and purge air vents.
13. Inspect fill valves.
14. Inspect and clean out strainers.

15. Inspect blow-off valve.
16. Inspect heat exchangers.
17. Inspect condensers.
18. Inspect feed water check valves.
19. Calibrate temperature control valve if required.
20. Lubricate pumps as needed.
21. Check electrical connections.
22. Troubleshoot and replace defective components.
23. Clean up work site.
24. Remove lockout and tagout and start up system if required.
25. Test operation of equipment.
26. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Steam system operation is monitored.

PROCESS

All performance elements for monitoring steam system operation are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

SKILL STANDARD

CONDITIONS OF PERFORMANCE

Given the following:

- Steam valves and traps
- Work order(s)
- Maintenance toolbox
- Personal protective equipment (PPE)
- Preventive/predictive maintenance procedures
- Manufacturers' instructions
- QS/ISO standards
- Environmental Protection Agency (EPA) requirements
- Occupational Safety and Health Administration (OSHA) requirements
- Local, state and federal standards/regulations
- Company policy and procedures
- Industry standards

WORK TO BE PERFORMED

Maintain steam valves and traps.

PERFORMANCE CRITERIA

Steam valves and traps are maintained according to manufacturers' instructions, company policy and procedures and industry standards.

Skill is performed with 100% accuracy.

Time required to complete the skill varies depending on size and type of steam valves and traps.

PERFORMANCE ELEMENTS

1. Review documentation and manuals.
2. Inspect work area for potential safety hazards.
3. Determine and obtain tools and equipment needed.
4. Put on PPE.
5. Identify any symptoms of potential malfunctions.
6. Analyze symptoms to determine possible causes.
7. Inspect joints for leaks.
8. Blow down the strainer to remove debris.
9. Test steam trap.
10. Observe steam trap discharge.
11. Shut down, lock out and tag out equipment if required.
12. Remove defective steam trap.
13. Inspect and repair check valve if necessary.
14. Tear down and repair defective components.

15. Install operational steam trap.
16. Clean up work site.
17. Remove lockout and tagout and restart system.
18. Test operation of equipment.
19. Document work performed.

PERFORMANCE ASSESSMENT CRITERIA

All OSHA and EPA requirements are followed.

QS/ISO standards are followed.

Local, state and federal regulations are followed.

PRODUCT

Steam valves and traps are repaired.

PROCESS

All performance elements for repairing steam valves and traps are critical. Performance elements are numbered to show appropriate sequence for completing the skill; however, a different sequence may be used.

Add	Increase fluid or pressure to the correct level or amount.
Adjust	Bring components to specified operational settings.
Air filter	Component used to trap dirt particles within duct systems.
Align	Bring to precise alignment or relative position of components.
American National Standards Institute (ANSI)	Organization that coordinates industry standards to promote equipment interchangeability.
Amperage (Amps)	Amount of current that flows in an electrical current.
Ballast	Piece of equipment required to start fluorescent lighting.
Bearing	Machinery device used to support, align and lower friction in moving or rotating parts.
Check valve	Device that allows a gas or liquid to flow in only one direction.
Clean	Rid component of extraneous matter for the purpose of reconditioning, repairing, measuring or reassembling.
Compressor	Machine used to increase pressure of a gaseous product.
Customer	Person(s) who benefits from maintenance being performed.
Environmental Protection Agency (EPA)	Government agency responsible for setting and enforcing environmental regulations.
Evaluate	Inspect for proper function.
Hot work permit	Internal company documentation to plan, notify appropriate departments and obtain approval to proceed with activities requiring intensive heat or open flame.
Install	Locate and hook up equipment.
Lockout tagout	Occupational Safety and Health Administration (OSHA) procedure which requires the removal of all energy in a system and prevents accidental start-up during maintenance.
Lubricate	Apply grease and oils in a machine to reduce wear and friction.
Maintain	Keep equipment in working order.
Material Safety Data Sheets (MSDSs)	Documentation which provides users with safety information on a specific product, chemical and/or material.
Measure	Compare existing dimensions to specified dimensions by the use of calibrated instruments and gauges.
Mount	Attach or place tool or component in its proper position.

National Electric Code (NEC)	Set of industry standards published by the National Fire Protection Association (NFPA 70) governing safe installation and maintenance of electrical systems.
National Fire Protection Association (NFPA)	Association that publishes standards for safe installation of fire detection and suppression systems.
Occupational Safety and Health Administration (OSHA)	Government agency responsible for setting and enforcing safety standards in the workplace.
Ohm	Unit of measure for electrical resistance.
Ohmmeter	Instrument used to measure electrical resistance.
Personal Protective Equipment (PPE)	Equipment designed to protect workers from workplace injury.
Quality Standards/International Standards Organization (QS/ISO)	Independent organization that sets and monitors quality assurance systems.
Test	Verify condition through the use of meters, gauges or instruments.
Torque	Tighten a fastener to specified degree or tightness (in a given order or pattern if multiple fasteners are involved on a single component).
Troubleshooting	Process of determining the cause of a system failure in a logical, efficient manner.
Underwriters Laboratories (UL)	Independent organization that tests products for public safety and security.
Volt-Ohm-Meter (VOM)	Meter used to measure electrical voltage and resistance.
Voltmeter	Instrument used to measure voltage.
Watt	Unit of power used to measure electrical power consumption.

Mechanical	C-clamps	Punches, center, set of 4
	Caliper, dial	Punches, pin, set of 4
	Chain puller	Safety locking block
	Chain breaker	Scale, 6" steel
	Chisels, assorted, steel cold	Screwdrivers, assorted, flat
	Feeler gauges (set)	Screwdrivers, Phillips, assorted
	Files, assorted	Screw extractor set
	Flaring tools	Scribes
	Flashlight	Shim stock, assorted
	Grease gun	Straightedge ¼"x1"x24"
	Hacksaw	Spirit level
	Handsaw	Square, combination
	Hammer, ball peen	Tags, safety
	Hammer, chipping	Tap and die set
	Hammer, claw	Tape, 10-foot steel measuring
	Hammer, dead blow	Tin snips
	Hex key, assorted	Tool storage box
	Indicators, dial	Tube bending equipment
	Inspection mirror	Utility knife
	Mallet, rubber	V-belt tension tester
	Micrometer, external 1"	Vise, bench
	Oilcan	Wrenches, hex box/open end, ¼-1"
	Pipe threading equipment	Wrenches, adjustable 6"-12"
	Pliers, locking	Wrenches, basin
	Pliers, needlenose	Wrenches, pipe, various sizes
	Pliers, regular	Wrenches, socket, 3/8" drive set
	Pliers, side cutter	Wrenches, socket, ½" drive set
	Pliers, slip lock	Wrench, torque
	Pry bar set	
Electrical	Amp probe	Fuse pullers
	Conduit bender	Volt-ohm multimeter
	Crimping tool	Wire strippers
	Fish tape	
Power	Circular saw	Reciprocation saw
	Drill and drill bits	
Painting	Putty knife	Scraper
Miscellaneous	Calculator	Refrigerant manifold set
	Lockout safety kit	

This listing is not all inclusive but consists of basic tools that are used to perform most skills contained in this publication.

Academic Skills	Skills (and related knowledge) contained in the subject areas and disciplines addressed in most national and state educational standards, including English, mathematics, science, etc.
Assessment	A process of measuring performance against a set of standards through examinations, practical tests, performance observations and/or the completion of work portfolios.
Content Standard	A specification of what someone should know or be able to do to successfully perform a work activity or demonstrate a skill.
Critical Work Functions	Distinct and economically meaningful sets of work activities critical to a work process or business unit which are performed to achieve a given work objective with work outputs that have definable performance criteria. A critical work function has three major components: • **Conditions of Performance:** The information, tools, equipment and other resources provided to a person for a work performance. • **Work to Be Performed:** A description of the work to be performed. • **Performance Criteria:** The criteria used to determine the required level of performance. These criteria could include product characteristics (e.g., accuracy levels, appearance, etc.), process or procedure requirements (e.g., safety, standard professional procedures, etc.) and time and resource requirements. The IOSSCC requires that these performance criteria be further specified by more detailed individual performance elements and assessment criteria.
Credentialing	The provision of a certificate or award to an individual indicating the attainment of a designated set of knowledge and skills and/or the demonstration of a set of critical work functions for an industry/occupational area.
Illinois Occupational Skill Standards and Credentialing Council (IOSSCC)	Legislated body representing business and industry which establishes skill standards criteria, endorses final products approved by the industry subcouncil and standards development committee and assists in marketing and dissemination of occupational skill standards.
Industry	Type of economic activity, or product or service produced or provided in a physical location (employer establishment). They are usually defined in terms of the Standard Industrial Classification (SIC) system.

Industry Subcouncil	Representatives from business/industry and education responsible for identifying and prioritizing occupations for which occupational performance skill standards are adapted, adopted or developed. They establish standards development committees and submit developed skill standards to the IOSSCC for endorsement. They design marketing plans and promote endorsed skill standards across the industry.
Knowledge	Understanding the facts, principles, processes, methods and techniques related to a particular subject area, occupation or industry.
Occupation	A group or cluster of jobs, sharing a common set of work functions and tasks, work products/services and/or worker characteristics. Occupations are generally defined in terms of a national classification system including the Standard Occupational Classification (SOC), Occupational Employment Statistics (OES) and the Dictionary of Occupational Titles (DOT).
Occupational Cluster	Grouping of occupations from one or more industries that share common skill requirements.
Occupational Skill Standards	Specifications of content and performance standards for critical work functions or activities and the underlying academic, workplace and occupational knowledge and skills needed for an occupation or an industry/occupational area.
Occupational Skills	Technical skills (and related knowledge) required to perform the work functions and activities within an occupation.
Performance Standard	A specification of the criteria used to judge the successful performance of a work activity or the demonstration of a skill.
Product Developer	Individual contracted to work with the standard development committee, state liaison, industry subcouncil and IOSSCC for the adaptation, adoption or development of skill standards content.
Reliability	The degree of precision or error in an assessment system so repeated measurements yield consistent results.

Skill	A combination of perceptual, motor, manual, intellectual and social abilities used to perform a work activity.
Skill Standard	Statement that specifies the knowledge and competencies required to perform successfully in the workplace.
Standards Development Committee	Incumbent workers, supervisors and human resource persons within the industry who perform the skills for which standards are being developed. Secondary and postsecondary educators are also represented on the committee. They identify and verify occupational skill standards and assessment mechanisms and recommend products to the industry subcouncil for approval.
State Liaison	Individual responsible for communicating information among all parties (e.g., IOSSCC, subcouncil, standard development committee, product developer, project director, etc.) in skill standard development.
Third-Party Assessment	An assessment system in which an industry-designated organization (other than the training provider) administers and controls the assessment process to ensure objectivity and consistency. The training provider could be directly involved in the assessment process under the direction and control of a third-party organization.
Validity	The degree of correspondence between performance in the assessment system and job performance.
Workplace Skills	The generic skills essential to seeking, obtaining, keeping and advancing in any job. These skills are related to the performance of critical work functions across a wide variety of industries and occupations including problem solving, leadership, teamwork, etc.

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Terry Hoyland	Caterpillar University Caterpillar, Inc.
Michael O'Neill	Chicago Building Trades Council
Janet Payne	United Samaritans Medical Center
Gene Rupnik	Rupnik Hospitality
Jim Schultz	Illinois Retail Merchants Association Walgreen Company

Dale Adamson	United Township Area Career Center
Bruce Braker	President Tooling & Manufacturing Association
Blouke Carus	President Carus Corporation
Frank Cavarretta	Subdistrict Director United Steelworkers of America
Gerson Ecker	Ecker-Erhardt
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Bob Shaw	Heartland Community College
Sam Splear	Manager, Employee Relations/Employee Development John Deere Harvester
Marvin Wortell	Chairman Triton Industries
John Kopatz	State Liaison Illinois State Board of Education

APPENDIX F

INDUSTRIAL MAINTENANCE GENERAL MAINTENANCE CLUSTER STANDARDS DEVELOPMENT COMMITTEE

Kenneth Anderson	I.B.E.W. Local 134 Chicago, IL
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Dick Young	Caterpillar University Peoria, IL
John Daum	Product Developer Richland Community College
John Kopatz	State Liaison Illinois State Board of Education

A. Developing an Employment Plan	1. Match interests to employment area. 2. Match aptitudes to employment area. 3. Identify short-term work goals. 4. Match attitudes to job area. 5. Match personality type to job area. 6. Match physical capabilities to job area. 7. Identify career information from counseling sources. 8. Demonstrate a drug-free status.
B. Seeking and Applying for Employment Opportunities	1. Locate employment opportunities. 2. Identify job requirements. 3. Locate resources for finding employment. 4. Prepare a resume. 5. Prepare for job interview. 6. Identify conditions for employment. 7. Evaluate job opportunities. 8. Identify steps in applying for a job. 9. Write job application letter. 10. Write interview follow-up letter. 11. Complete job application form. 12. Identify attire for job interview.
C. Accepting Employment	1. Apply for social security number. 2. Complete state and federal tax forms. 3. Accept or reject employment offer. 4. Complete employee's Withholding Allowance Certificate Form W-4.
D. Communicating on the Job	1. Communicate orally with others. 2. Use telephone etiquette. 3. Interpret the use of body language. 4. Prepare written communication. 5. Follow written directions. 6. Ask questions about tasks.
E. Interpreting the Economics of Work	1. Identify the role of business in the economic system. 2. Describe responsibilities of employee. 3. Describe responsibilities of employer or management. 4. Investigate opportunities and options for business ownership. 5. Assess entrepreneurship skills.
F. Maintaining Professionalism	1. Participate in employment orientation. 2. Assess business image, products and/or services. 3. Identify positive behavior. 4. Identify company dress and appearance standards. 5. Participate in meetings in a positive and constructive manner. 6. Identify work-related terminology. 7. Identify how to treat people with respect.

G. Adapting to and Coping with Change	1. Identify elements of job transition. 2. Formulate a transition plan. 3. Identify implementation procedures for a transition plan. 4. Evaluate the transition plan. 5. Exhibit ability to handle stress. 6. Recognize need to change or quit a job. 7. Write a letter of resignation.
H. Solving Problems and Critical Thinking	1. Identify the problem. 2. Clarify purposes and goals. 3. Identify solutions to a problem and their impact. 4. Employ reasoning skills. 5. Evaluate options. 6. Set priorities. 7. Select and implement a solution to a problem. 8. Evaluate results of implemented option. 9. Organize workloads. 10. Assess employer and employee responsibility in solving a problem.
I. Maintaining a Safe and Healthy Work Environment	1. Identify safety and health rules/procedures. 2. Demonstrate the knowledge of equipment in the workplace. 3. Identify conservation and environmental practices and policies. 4. Act during emergencies. 5. Maintain work area. 6. Identify hazardous substances in the workplace.
J. Demonstrating Work Ethics and Behavior	1. Identify established rules, regulations and policies. 2. Practice cost effectiveness. 3. Practice time management. 4. Assume responsibility for decisions and actions. 5. Exhibit pride. 6. Display initiative. 7. Display assertiveness. 8. Demonstrate a willingness to learn. 9. Identify the value of maintaining regular attendance. 10. Apply ethical reasoning.
K. Demonstrating Technological Literacy	1. Demonstrate basic keyboarding skills. 2. Demonstrate basic knowledge of computing. 3. Recognize impact of technological changes on tasks and people.
L. Maintaining Interpersonal Relationships	1. Value individual diversity. 2. Respond to praise or criticism. 3. Provide constructive praise or criticism. 4. Channel and control emotional reactions. 5. Resolve conflicts. 6. Display a positive attitude. 7. Identify and react to sexual intimidation/harassment.
M. Demonstrating Teamwork	1. Identify style of leadership used in teamwork. 2. Match team member skills and group activity. 3. Work with team members. 4. Complete a team task. 5. Evaluate outcomes.

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